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The Award of the Contract for the Cross River Dam.

The dam for the Cross River reservoir of the Croton works supplying New York City will be a structure of cyclopean concrete faced with concrete blocks. This reservoir is one of two emergency storage basins to be created for supplementing the present Croton system. The emergency feature is due to the severe shortness of water to which the city of New York will be subjected should even one dry year occur. These two reservoirs, the Cross River and that projected at Croton Falls, will utilize a large portion of that part of the Croton River flow which now runs to waste in wet years or in periods of flood. The storage resulting from their construction, therefore, is of vital importance to the city if it can be secured at the earliest possible date, but it loses importance rapidly with delay in its availability to the city. These points have been repeatedly urged by the Commission on Additional Water Supply, by the chief and consulting engineers of the Aqueduct Commission, and by the last two commissioners and chief engineers of the Department of Water Supply, Gas and Electricity.

Public advertisement was made for tenders for the construction of the Cross River dam and other affiliated work, to be publicly opened before the Aqueduct Commissioners on May 31. As has already been published in The Engineering Record, the bids opened ran from $1,080,319 to $1,344,030, the lowest being made by Barton Dunn and the highest by Coleman, Breuchaud & Coleman. The chief engineer's estimate for the total value of the work was $1,315,000, standing reasonably in relation to the totals offered by the bidders. On the opening of the bids the proposals were all referred to the chief engineer of the Aqueduct Commission for a complete detailed report on the resources of the various bidders to do the work, including statements as to their past contracts, efficiency of administration of their works, promptness in completion of contracts, and availability of plant and organization. This report was made in full over the signatures of both the chief and the consulting engineers of the Aqueduct Commission, and stated unqualifiedly that MacArthur Brothers Co. & Winston & Co., next to the highest bidders, and Coleman, Breuchaud & Coleman, were the best fitted by past experience and present organization and plant to perform the work in the manner specified and within the prescribed period of twenty-six months, but as MacArthur Brothers Co. & Winston & Co.'s bid was $1,246,211.60, while Coleman, Breuchaud & Coleman's tender was highest of all, the offer of the latter was obviously out of consideration. This report, therefore, amounted in substance to a recommendation of award of the contract to MacArthur Brothers Co. & Winston & Co. The proposition to award the contract to the next to the highest of seven bidders, even under clear emergency conditions, was so unprecedented that the Aqueduct Commissioners properly felt it their duty to refer the entire matter, including the report of their chief and consulting engineers, to the chief engineer of the Department of Finance. The latter, however, was compelled by death in his family to turn the matter over to his principal assistants, who, after careful investigation, reported unqualifiedly in favor of making the award to MacArthur Bros. Co. & Winston & Co. Again the Aqueduct Commission hesitated and delayed final action for another week to secure the report of the chief engineer of the Finance Department. The latter report proved to be a full confirmation in every respect of the two preceding reports, and on June 20 the contract was awarded to MacArthur Bros. Co. & Winston & Co.

This action of the Aqueduct Commission is a remarkable event in the annals of municipal contracts of the city of New York. It is by no means the first time that the lowest bidder has failed to secure a New York City contract, but it is probably the initial award made to the next to the highest bidder, where so many tenders were received. This award must not be taken to mean to any extent whatever that there were not responsible or competent bidders lower than the successful party, for several among them were unusually strong contractors, with most creditable past records and efficient organizations.

The engineers apparently took the ground that the work to be done was first of all of an emergency character and that no considerations ordinarily governing awards should be allowed to outweigh the fact that the Cross River work is pressingly urgent and its earliest possible completion is an imperative necessity to the city.

The Aqueduct Commissioners were certainly correct in their reluctance to make an award apparently in violation of the competitive system of securing contracts for the city, although the law creating that Commission permits it to award contracts as it may deem best for the city's interest. On the other hand, the complete concurrence shown in the three engineering reports, the final conclusions in which were largely identical and justified by different lines of argument, could not be disregarded. The controlling conditions were radically different from those usually attending competitive awards. These conditions were so clear to the minds of the five engineering advisers of the Aqueduct Commission that they were compelled to recommend an unprecedented procedure, and these commissioners have rendered the city a remarkable service in shaping their award in accordance with that recommendation.

This emergency action has in no wise trenched upon the proper field of competitive bidding. Doubtless the commissioners felt compelled to take the lowest responsible bidder, and they could have justified themselves in doing so. There would then have been a reasonable prospect, perhaps, of a prompt completion of the contract, but evidently the engineers felt that so long as the aggregate tender for the work was reasonable the award should be so made as to secure not only assurance but the greatest possible assurance of the early completion of the work, and the award is plainly justifiable on those grounds. The result indicates that the affairs of the Aqueduct Commission are being administered with both force and wisdom; but there must be caution that this justifiable emergency procedure be not made a precedent against judicious competitive bidding.

Standard and Special Machinery.

The relative merits of standard and special machinery were under discussion at the last meeting of the National Electric Light Association, the subject being introduced through a paper by Mr. David Hall on "the paramount importance" of selecting standard rather than special apparatus. It will doubtless be acknowledged that the word "paramount" is considerably overworked in these days, particularly in such a connection as that mentioned. It is a very strong adjective and its use with reference to the relative merits of the two classes of machinery is hardly warranted, except in an ex parte argument with the intention of stating one side of a subject as strongly as possible. Standardization seems to mean two entirely different things. To the engineer it signifies apparatus or methods that can be applied in a large number of cases to greater advantage than special apparatus or methods. To the manufacturer, or, rather, to his selling department, standardization seems to mean that final embodiment of perfection represented by his own products, criticism of which indicates some unfortunate mental aberration. The Engineering Record is inclined to the opinion that standardization is desirable in a far greater number of cases than specialization, but this opinion needs some explanation.

The subject is, in its essential features, a simple case of the fundamental problem of engineering, to accomplish a given end in the most economical manner consistent with the result desired. If this can be done by following standardized plans and adopting standard equipment, that should be done, otherwise special designs must be used. The advantages of standardization are clearly shown in American structural steel design and manufacture, as stated very clearly in the address of President Schneider before the American Society of Civil Engineers last week. This satisfactory condition has resulted from the fact that the consulting specialists in such work have almost invariably had considerable training in bridge shops and know how to produce designs which will go through shops with a minimum expense for the grade of material and workmanship desired. In other words, the standardization in American bridge design is on a rational basis, and if plans are prepared by a consulting expert which call for unusual methods or materials, these departures from the usual procedure are made with a full knowledge of the extra cost involved.

Portland cement is in a similar stage. Uniform specifications have been recommended by numerous national organizations. These give the engineer a certain latitude and at the same time permit the manufacturer to fill up his stock bins with a product that he knows can be sold for most of the purposes for which Portland cement is required. He stands ready to make special cements if they are needed, but he frankly states that their cost will be considerably above that of the standard grades. Sometimes they certainly will be required, as in submerged foundation work under unusual conditions where a quick-setting cement is necessary, but as a rule it will be to the advantage of the engineer to use one of the grades provided by the standard specifications.

When it comes to engines, electrical apparatus and the like, the subject is much more difficult to settle in many cases. The standard designs are made to fit the great majority of orders. The shops are organized to make these standards, and this investment is often a heavy one. To produce special apparatus requires changes in every department from the drafting rooms and foundry forward. These changes are expensive, and the purchaser of the apparatus in which they are embodied must pay for the changes. It is doubtful if the extra cost of such special apparatus and the difficulty of getting repair parts for it warrant its general use. On the other hand, it is true that there are occasions when large extra expense is fully justified by the necessity for equipment entirely adapted to the conditions, but it is probable that such equipment will take the form of radically new designs and possibly the use of new principles rather than slight changes in standard types.

In these days of severe commercial competition manufacturers can be relied upon to improve their standard lines in order to keep abreast of general progress in the industry with which they are connected. Nothing is so fatal to a manufacturer as to have the reputation of building antiquated machinery. On the other hand, no manufacturer is yearning to invest a considerable sum in machinery employing new principles when the same end is satisfactorily accomplished otherwise. In order to make such innovations, outside stimulus from the engineer is needed, and it is the engineer's duty to apply it. It is important to bear in mind that what is standard to-day will be obsolete to-morrow, and the engineer, of all men, should hesitate to keep back progress.

Water Works Charges for Factory Fire Protection.

Some years ago the owners of cotton and woolen mills in New England decided, in order to lessen their annual insurance premiums, to pool their expenses and their fire experience, with a view to carrying their own insurance. The outcome of this decision was the successful organization known as the New England Factory Mutuals, whose intelligent efforts produced a system of fixing insurance rates which, in its essential features, has since served as a model for the regular stock companies doing insurance business in all parts of the country.

The controlling principle in insurance rating is that the rate should be proportionate to the fire hazard. A factory which has a complete fire protection equipment is less hazardous, and can be insured at a lower rate, than one whose fire protection is not up to the standard. This means that the owner of a factory equipped with fire protection service supplied from city water mains, derives an actual cash benefit of so many dollars per annum in the reduction of his premium in consideration of this fire protection connection. If the factory should burn down, the owner would be subjected, in addition to the actual property loss, which would be covered to a large extent by insurance, to loss of business while the plant was idle, and against this loss, often very serious, his only insurance would be the manner in which the plant was built, equipped and operated with a view to protection against fire. Here again he would derive an actual benefit from the fire protection connection with the city mains, a benefit which, while it cannot be actually measured in dollars and cents, might readily be considerably larger than the actual cash reduction in annual premiums.

While it is true that in lessening his individual fire hazard, the owner would also lessen to some slight extent the conflagration hazard of the community in which his factory is located, yet this benefit to the community is very slight as compared to the amount by which he profits individually by his fire protection connection. The openings in his fire protection service pipes are on his premises, and many of them are inside his buildings. They are not readily accessible for use in protecting the property of others. And it must not be forgotten that should the factory owner be dishonest enough to do so, his large fire protection pipe puts it within his power to draw, without detection, large quantities of water from the mains. Or, his pipes might leak, or be broken, with similar results.

In this sense he constitutes, in the aggregate, a menace to the water supply of his community, which is probably at least commensurate with the reduction, in the aggregate, of the general conflagration hazard by reason of his fire protection equipment. Offsetting the one against the other, the owner of a factory equipped with fire protection system supplied by a special connection to the city mains may fairly be considered to be the sole and exclusive beneficiary of such connection.

In order to be in a position to supply water for fire protection, the local water department or water company must be put to expense. If the fire service is provided with one of the new detector devices, to compute the cost or value of fire protection on the basis of water actually used to extinguish fire would be analogous to computing the cost or value of a navy on the basis of the ammunition expended in actual warfare.

In a paper read before the American Society of Civil Engineers in April, 1897, Mr. Emil Kuichling estimates that fully one-third of the annual charge on the cost of construction of the average plant is due to provision for fire protection. He also estimates that about one-fifth of the operating expense is chargeable to provision for fire service and provision for future growth, the latter being about one-half of the former; so that, according to Mr. Kuichling, about 33 per cent. of the fixed charges due to construction, and 14 per cent. of the operating expenses, are chargeable to provision for fire protection. Another eminent authority, Mr. J. T. Fanning, in a paper read before the American Water Works Association in May, 1896, estimates that about two-thirds of the construction cost of the average plant, and about one-third of its operating and maintenance expenses, are chargeable to the provision made for fire protection. Averaging these two estimates, it will be seen that about 50 per cent of the annual fixed charges due to construction cost, and 20 per cent. of the annual operating and maintenance expenses, are chargeable to the fire protection item.

The total receipts of the water department or water company should be sufficient to pay: First, a reasonable interest on the investment; second, annual contribution to sinking fund to retire the amount invested within a reasonable time, say, 30 years; third, annual contribution to sinking fund for depreciation, on basis of same period; fourth, annual operating expenses, including repairs and minor betterments. These total receipts should be divided, as equitably as possible, between the charges for domestic service and those for fire protection service.

Fire protection service may be either public or private. Under public fire protection would be included that provided by the fire hydrants located on the public streets. The special fire protection facilities afforded to individual establishments, such as the factory previously alluded to, may be classed as private fire protection.

It seems but fair that public fire protection should be paid for by general taxation, in the case of private ownership of works, in the form of hydrant rentals; and in the case of municipal ownership, by an equivalent annual payment from the general fund into the fund provided for water works.

The factory owner and others, who, like him, may be considered the sole and exclusive beneficiaries of private fire protection, should each pay his quota of the amount of the total receipts properly chargeable to that item. It is admitted that it will often be a very difficult and complex matter to determine in any particular case just what the fair charge should be, and that for some time to come the rate will be only fixed after a dicker between the factory owner and the water works superintendent in which each will try to get as much as he can. But it is necessary in all such matters to have a starting point, and it is hoped that these suggestions may serve as an outline of the principles which should, in fairness, govern the establishment of the rate.

Indirect Damages from Reservoir Construction.

A few weeks ago mention was made of the fact that the indirect damages which can be collected, even under the most favorable legislation, are very small in cases arising from the appropriation of water and the construction of reservoirs. It so happens that the Massachusetts Supreme Judicial Court rendered an illuminating opinion on this subject last month in Allen v. Commonwealth, 74 N. E. Rep. 287. The legislature of the commonwealth, by a series of acts, undertook to deal most liberally with those injured by the construction of the Wachusett reservoir of the Metropolitan Water Works. Ordinarily, the damage done to a person's business is not a matter for which he is entitled to compensation, but in this case, in addition to providing compensation for real estate taken and that not taken but decreased in value, the legislature provided that in certain cases individuals and firms should be compensated for damage done to their business.

The plaintiff in this case had a 50-acre farm, from which he supplied hay, vegetables, eggs, milk and cider in the neighboring village. He had no regular customers for any of these things. The village was destroyed by the construction of the reservoir and the plaintiff's action was to recover the damages thereby caused to his business.

The point was raised by the commonwealth's lawyers that as the plaintiff had no regular customers he could not have an established business in a legal sense. The court decided that farming was a business and that the plaintiff was legitimately engaged in it, and had been for at least fifteen years, which was sufficient proof that it had no element of uncertainty in it. Had the purchasers of the products gone to the farm to obtain them, there would probably have been no question about the established character of the business, and the court ruled that the manner in which the surplus products were actually sold should not be considered an argument against assigning it this character.

The court pointed out clearly that the legislature did not intend that everyone injured in business or occupation should be compensated for it. Such an attempt would be impracticable, but the best practicable relief was afforded. By the building of the reservoir certain towns and villages would be altogether destroyed and their inhabitants dispersed. Naturally there would be cases in which individuals derived support for themselves and their families, in whole or in part, from supplying the wants of these inhabitants. Any such business would be largely or wholly destroyed, and the legislature took means to relieve such damages in case the business was established, like that of the plaintiff in this case.

Attention is particularly called to this case because it sets forth the Massachusetts view of the subject very clearly. That state has made greater provision for such indirect damages than has ever before been put on American statute books, and it is most interesting to observe that in this case the damages assessed by the commissioners for the purpose and approved by the court were but $150 and costs. In view of all these facts, it will be perfectly clear why this journal has held the opinion that indirect damages arising from reservoir construction have been regarded with too much apprehension by the authorities of large cities about to undertake works for an additional water supply.

Notes and Comments.

The New Maintenance of Way Organization of the Baltimore & Ohio R. R. provides an engineer of maintenance of way on the territory of each general superintendent, and will admit of thorough supervision of all details of work of this nature. Reports on such work will be from the offices of the general superintendents to the chief engineer of maintenance of way, an office to which Mr. J. B. Dickson was recently appointed.

The Eighteen-Hour Train Service between New York and Chicago will not be abandoned as the result of the accident in Ohio last week. An 18-hour schedule is desirable for business reasons and it is manifest that it can be readily furnished. The act of some malicious lunatic in misplacing a switch at a country village would wreck any kind of an express. There is no greater danger in maintaining an 18-hour schedule than one of 24 hours, but there is danger in letting the man who tampered with the Mentor switch remain outside the walls of an asylum.

The Charlotte Sewage Disposal Plant, described last week, deserves particular attention on account of the great volume of sewage treated per acre. The degree of purification desired is not great, only enough to prevent fouling the stream that receives the effluent, but this fact in no way detracts from the importance of the results obtained. By an unfortunate error the titles of the chlorine and oxygen-absorbed charts published last week were interchanged, an error that probably misled no reader, but should nevertheless be corrected.

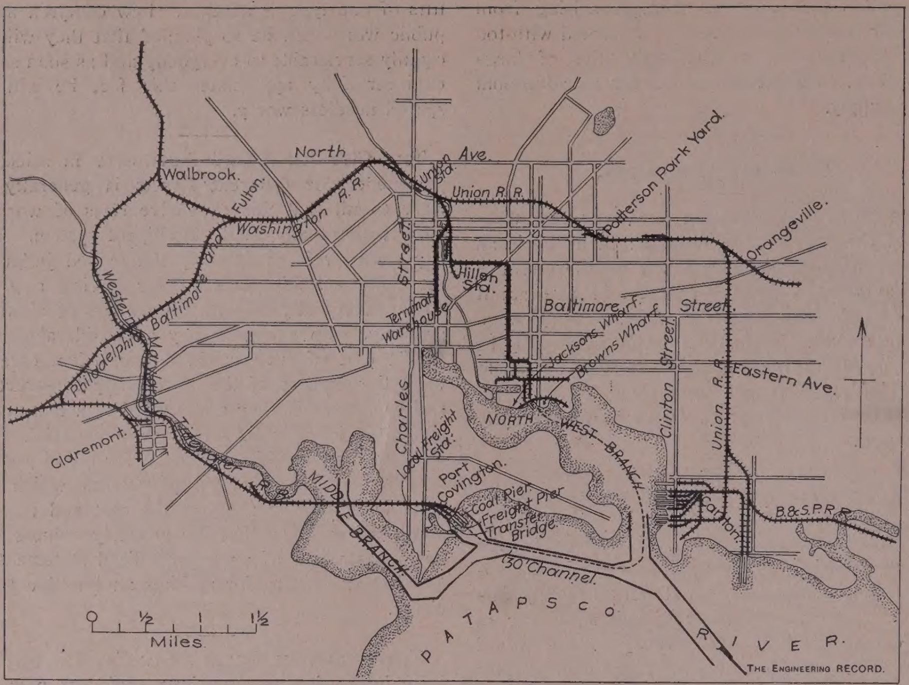
The Wachusett Dam at Clinton, Mass., has been practically completed, for the last stone of the cornice was laid on June 24. A stone parapet has still to be added and considerable grading remains to be done. When all this work is finished the dam and its surroundings will have an unusually effective appearance, for Mr. F. P. Stearns, the designer, was able to designate, before any work began, the disposition of a considerable amount of spoil so as to secure landscape architectural effects of a most pleasing character. The dam, fully described in this journal on September 8 and 15, 1900, and subsequent issues, has a somewhat heavier section than usual, and its accessory structures as well as the great earth dikes forming part of the rim of the reservoir, make it one of the notable works of our time.

In Planning Small Sewerage Systems it occasionally happens that a few houses or a shop are so located that it is impracticable for them to have a gravity connection with nearest sewer unless the latter is laid in a deeper trench than is otherwise necessary. This has recently occurred in a Massachusetts town, where a factory which is one of the leading local industries is so situated that it cannot be connected with the sewer except by a pipe rising above the surface of the mill yard at one place. The factory manager insists that the location of the sewer is a mistake. It is, of course, possible that the sewer might have been laid through a parallel street of lower elevation, although no information on this point is at hand. The main point to consider is, however, the expediency of costly trenching for the sake of serving a few such buildings. As a rule it is best to ignore them, and let the owners put in sewage lifts of one type or another. Few comprehensive public works can be so planned that they will be equally serviceable to everybody and as soon as an engineer fully appreciates this fact he will be spared needless worry.

The City Engineer's Authority in selecting pavements for different streets is generally so close to nil that this expensive class of work is done without any really intelligent system. The city engineer is presumably the official judge of the most suitable material for paving a given street. Naturally enough, the owners of abutting property, who generally pay a considerable part of the cost of such work, do not often care to meet the expense of the most costly construction and consequently they are entitled to a reasonable amount of influence in selecting the material. The right method would seem to be for the city engineer to designate certain pavements which are suitable, stating in a report the cost and relative merits of each, so that the property owners will be in possession of an unprejudiced statement of the facts necessary for making an intelligent decision.

The Irrigation Situation in Egypt is particularly interesting to American engineers now because of the probability that the Wady Rayan must be turned into a reservoir basin. This depression has been the subject of numerous articles by Mr. Cope Whitehouse, of Newport, R. I., who achieved international reputation years ago as the discoverer of the site of Lake Moeris, dug about 2000 B. C., by King Amenemhat III and described by Diodorus, Strabo and Herodotus. At the present time, the problem is in the following stage: About 4,000,000,000 cu. m. of water are needed to convert irrigation from the flood to the perennial system, and the Assuan dam at its present height will store a quarter of this amount. There seems to be no way of furnishing the remaining storage so inexpensive and safe as the construction of the Wady Rayan reservoir long advocated by Mr. Cope Whitehouse and raising the height of the Assuan dam, if it can be done safely. It will doubtless be recalled that American capitalists have been ready for many years to execute the Wady Rayan project on very reasonable terms, but the Egyptian government has been opposed to allowing private parties to have any sort of authority over irrigation works.

The Late James Mansergh, whose death was reported in last week's issue, was well known to many American engineers. His conservatism was tempered by a keen interest in all novel methods and practices, and for this reason his advice was highly prized in the United States. Another reason, possibly, for this good opinion was his very frank criticism of certain of our methods of construction, notably high earth dams with masonry cores; it was felt that such criticism was more likely to be useful than the perfunctory approval which some consulting engineers always give. In this connection it is interesting to recall that the earth embankment at the south end of the Croton dam, which he mentioned in one of his criticisms, has been replaced by a solid masonry structure. Although of late years his work was connected very largely with water and sewerage undertakings, in early life he had considerable experience in railway location and construction, serving for a time as the contractor's engineer on important undertakings. It was this personal knowledge of the methods of handling materials and men which frequently made his advice of unusual value. Mention should also be made of his admirable work as an arbitrator. Years ago he was a valued contributor to this journal, and at later periods furnished data for important articles on works with which he was connected.



Terminal Tracks and Leased Lines in Baltimore.

THE BALTIMORE TERMINAL OF THE WESTERN MARYLAND R.R.

The Atlantic Terminus of the Gould Railroad System.

The new Baltimore terminal works of the Western Maryland R. R. are already in partial operation, and when completed will have cost nearly $3,000,000, and will not only furnish the only outlet on the Atlantic seaboard for the Gould system of railroads, but will be the terminus of the only single system of roads under one management reaching from the Pacific to the Atlantic. From the terminus of the main line at Wallbrook, the Tidewater R. R., about six miles long, has been built with about an equal amount of single and double tracks to Port Covington on the Patapsco River, where coal and freight piers have been established and a deep channel has been dredged to the main U. S. harbor. This line, together with the Philadelphia, Baltimore & Washington R. R., the Union R. R. and Northern Central R. R. over which the Western Maryland R. R. has certain trackage contracts, forms a belt enclosing an area of the city about 6 miles long and 3 miles with, with connections to all the roads entering Baltimore and a long waterfront on the Patapsco River.

The Tidewater R. R. follows, for most of its length, close to the shores of Gwynnes Falls, and the middle branch of the Patapsco River and crosses the latter on a double track pile trestle and a 200-ft. plate girder bridge 2,167 ft. long, with a 221-ft. draw span, having an 85-ft. clear opening each side of the concrete pivot pier 30 ft. in diameter. The latter was built in a circular caisson with a grillage floor 3 in. thick, sunk on the levelled tops of foundation piles 60 ft. long cut off 27 ft. below low water. There are also twelve plate girder spans with concrete abutments for overhead highways and for the crossings of two overhead railroads and three crossings at Gwynne's Falls. The girders have maximum spans of about 95 ft. and were built and erected by the Pennsylvania Steel Co. At Westport there is a four-stall roundhouse, and at Port Covington there are about 30 stub tracks in the 16-acre yards, which have about 1,000 ft. water front protected by a bulkhead and dredged to accommodate at low tide the largest ships that enter this harbor.

The bulkhead consists of timber cribs 8 ft. high, which are filled with rock, decked over, and seated on six longitudinal rows of piles, cut off at low water level. In front of the bulkhead the depth of the water which was originally from 10 to 12 ft. has been increased to 30 ft., and a 500-ft. channel 30 ft. deep and 1,300 ft. long has been made to the government channel by the Maryland Dredging Co., which excavated in all about 900,000 cu. yd. of material.

The stub tracks are all at right angles to the bulkhead and most of them terminate about 40 ft. from it, except three which extend to the outer end of the coal pier, and two which extend through the full length of the freight pier. At present they are divided into three groups by the tracks which extend to the pier ends and have wider spaces on each side than the other tracks have. At the shore ends all the tracks are connected with long radius curves with the two main Tidewater tracks, which make an angle of about 40 degrees with the water front. The longest of the stub tracks is nearly 1,200 ft. long to its intersection with the main line.

The coal pier, 60 ft. wide and 1,250 ft. long, has a storage capacity of about 2,000 tons, but is intended chiefly to deliver coal directly from the mine cars to vessels which can be moored to it on both sides. From four to eight vessels can thus be simultaneously loaded through all their hatchways at once, and it is estimated that an average of 1,000 tons per hour can be unloaded on this pier. The pier is built entirely of timber and is supported on piles about 75 ft. long driven 45 ft. to a penetration of about 40 ft. in the mud, with a refusal of ½ in. under a 2,000-lb. hammer falling 20 ft., and are loaded to a uniform maximum of 5 tons each.

Loaded coal cars from three long yard tracks are delivered to a single track, pass over a scales and are pushed by a barney car to the shore end of the pier which rises with 233 ft. of 21.2 per cent. grade to a summit near the bulkhead line, where the height is about 70 ft. above mean high water. The track is forked on the incline and one branch goes on each side of the pier, descending at a grade of 1 per cent. to the river end of the pier, 682 ft. away, and allowing the cars to stop and deliver their contents through chutes or into the bins at any intermediate points. Near the river end of the pier the grade increases slightly and terminates at a level transfer platform where the cars are shifted on an automatic radial swinging transfer table to a single track between the twin delivery tracks which descend through the trestle bents at a grade of 2.8 per cent to the shore, where it is offset 62 ft. from the delivery track and runs parallel to it to the scales where the cars are weighed out. The only power needed for the pier is that used to operate the barney car, which is supplied by a 20 x 36-in. Allis-Chalmers double hoisting engine located, with its boiler, in a steel and concrete house under the incline.

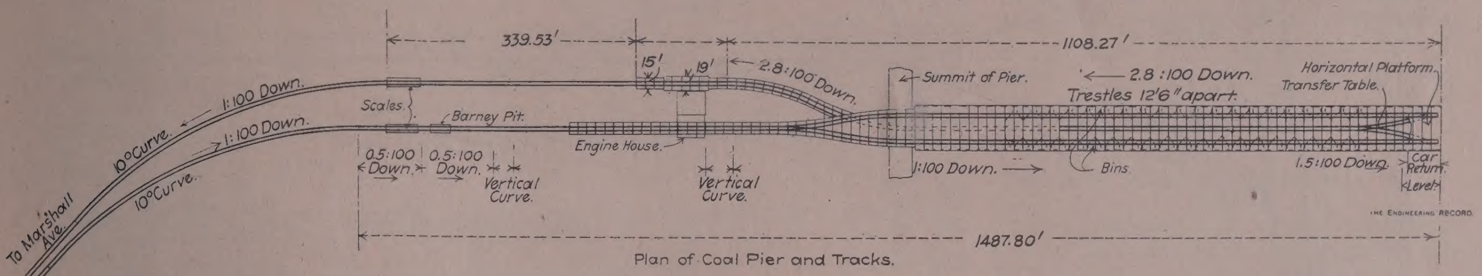
The pile foundation for the coal pier is 729 ft. long, and is made with transverse bents 12 ft. apart, of 22 piles each braced and decked as shown in the part elevation. The top is covered continuously with a floor built with a lower course of diagonal 10 x 2½-in planks laid 10 in. apart in the clear and an upper course of 10 x 2½-in. longitudinal planks laid close together and supported on 3 x 12-in. longitudinal joists 12 in. apart on centers. The sills, caps, vertical and inclined posts of the coal trestle are made of 12 x 12-in. yellow pine, and the sills are laid on the pier deck in the planes of the pile bents but not connected to them. The bents are X-braced longitudinally by 4 x 10-in. pieces and transversely by 3 x 12-in. planks with one ¾-in. bolt at each intersection and having the ends of the planks continued across the caps and sills to serve for scabs.

There are in the superstructure 110 framed bents, which vary according to the height and the relative positions of the three or four tracks for full and empty cars. Beginning at the river end the first four bents support the level platform where the cars are shifted from the incoming to outgoing tracks. These each have ten vertical posts and two inclined posts in the center, and are about 47 ft. high over all. Toward the shore the return track descends between the other two tracks which ascend and the regular bents correspond with the arrangement shown for bent 6. Beyond the summit the delivery tracks begin to descend and the return track diverges from the center line of the pier and is carried in some cases under the other tracks and in some cases on the outside of the bent as indicated in the elevations of bents D 6 and D 10. Where the two tracks unite in one they are carried on simple four-post bents with concrete piers as shown in the elevation of D 15. Where the two tracks are close together so as to be gauntleted they are carried on bents similar to D 15, except that they are made wider, with 24¼-ft. caps and four vertical posts in the center.

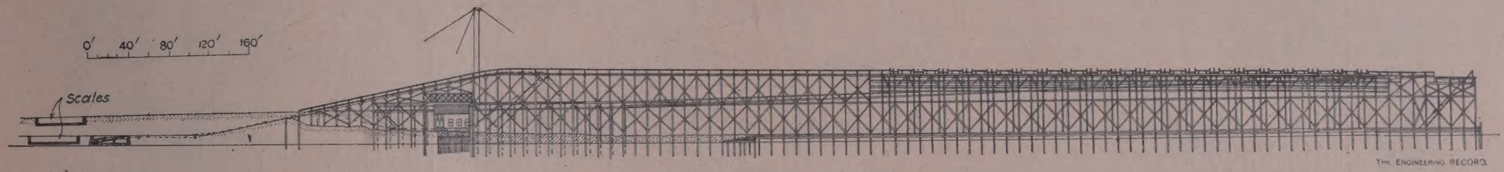
The transfer table at the river end of the pier has a 36-ft. length of level track supported on trussed beams strongly braced together transversely and pivoted 12 ft. from one end and 27 ft. from the other end. It is mounted on four flangeless wheels with short segmental tracks on which it revolves through an arc of about 16 degrees to shift the center of the outer end from the center of one delivery track to the center of the other, the other end of the turntable always engaging the upper end of the return track just beyond the point where the four rails converge to two. As the cars all move in one direction an opportunity was afforded to utilize their weight to operate the transfer table, and this was done so as to make it automatically shift an empty car from the delivery track to the return track and then return to the original position for another car. The long end of the transfer table travels on an inclined track down which it is moved by the weight of the empty car. As it descends it pulls up an 800-lb. counterweight, which is heavy enough to pull the empty table back to the upper position when the car leaves it.

The coal bins extend continuously from end to end of the pier under each delivery track. They are made entirely of wood, with an open top, one vertical and one inclined longitudinal side covered with 2-in. horizontal planks. Each bin is 25 ft. or two panels long, and the ends are made with transverse inclined wooden sides giving it a hopper shape with a bottom opening connected with the top of a vertical wooden chute 30 ft. long.

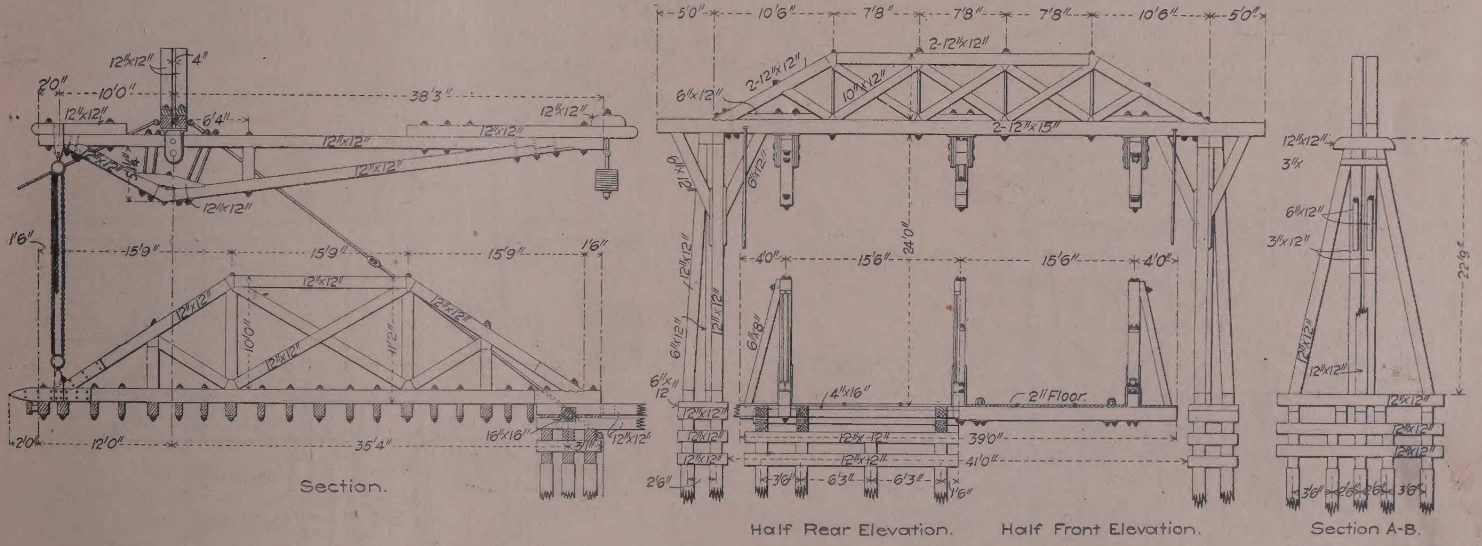
The hoppers and vertical wooden chutes are lined with 1/8-in. steel throughout, and the opening in the hopper is commanded by a curved steel gate hinged on a horizontal axis at the upper edge and operated by a link and toggle with a long handle reaching to the upper deck of the pier. The curved lower edge of the gate cuts through the coal normally to its flow, and can be easily operated when the coal is flowing and is held safely in position by the maximum pressure of the toggle which is locked shut by passing over the center so that it cannot be accidentally opened, but is easily released by the minimum effort on the lever.



Plan of Coal Pier and Tracks.



Coal Pier at Port Covington.



Section. Half Rear Elevation. Half Front Elevation. Section A-B.

Transfer Bridge for Loading Coal Cars on Harbor Floats.

Port Covington Coal Pier and Transfer Bridge.

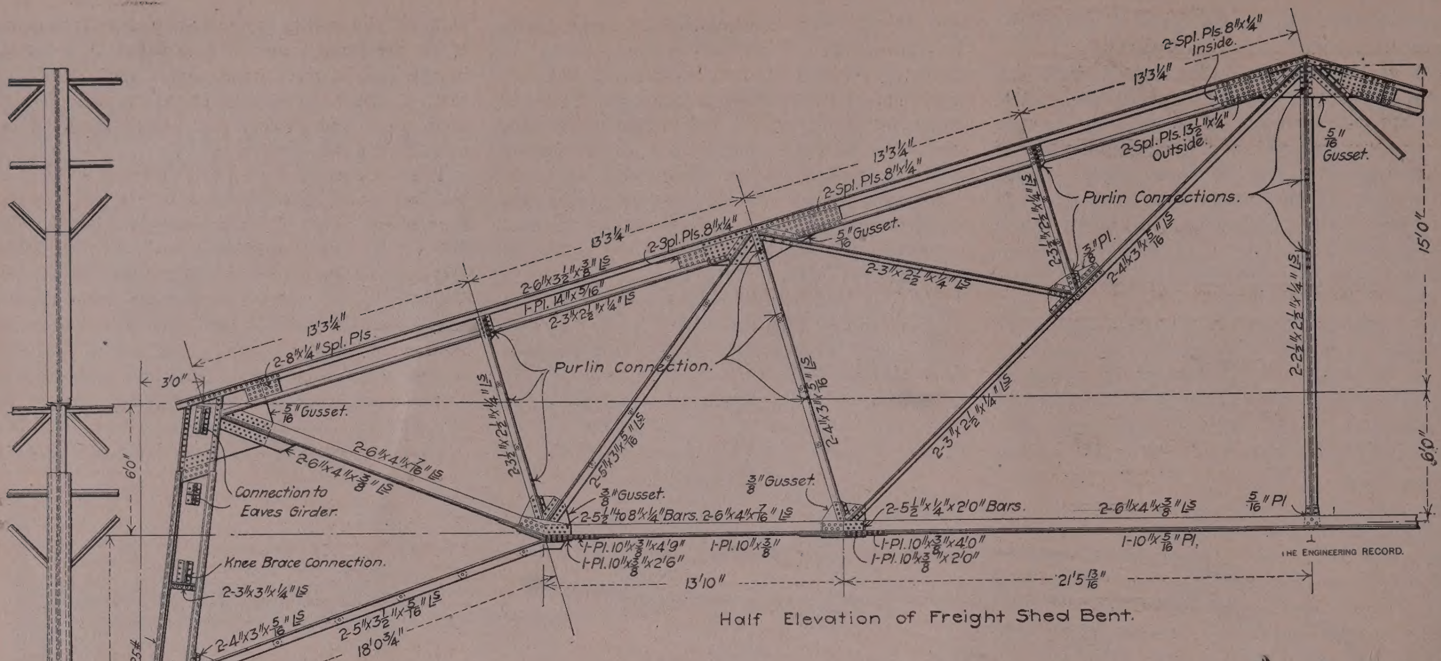
The vertical chute is closed on three sides and open on the river side, where it has guides to receive the upper end of an inclined, movable steel chute, through which the coal is delivered to the hatches of the vessels at any height or in any position. The chute has sufficient vertical motion to allow for any difference in tide or in the height of the vessel, and can be deflected laterally enough to reach the required point of delivery without moving the vessel. The upper end of the chute terminates in a steel hopper moving inside the vertical wooden chute and receiving all coal which is discharged from the bin. The chute and hopper are counterweighted and suspended from two differential blocks operated from the lower deck of the pier by sprocket chains passing down through vertical pipes.

Adjacent to the coal pier and parallel with it is the freight pier for export business. It has a one-story steel shed 40 ft. high on a pile and wooden deck platform 120 ft. wide and 840 ft. long. The superstructure is 110 ft. wide, with slightly inclined longitudinal walls and has three large doors in the shore end, two in the river end and 20 doors 20 ft. wide and 16 ft. high on each side of the building. It is lighted by some side windows at the shore end and by an 80 x 8 x 8-ft. skylights in the flat roof. The framework has 22 transverse vertical bents 40 ft. apart in the 20 regular panels, which are connected by the purlins, by a line of longitudinal lattice girders at each eave, and by one panel of lateral bracing in the roof at each end of the building.

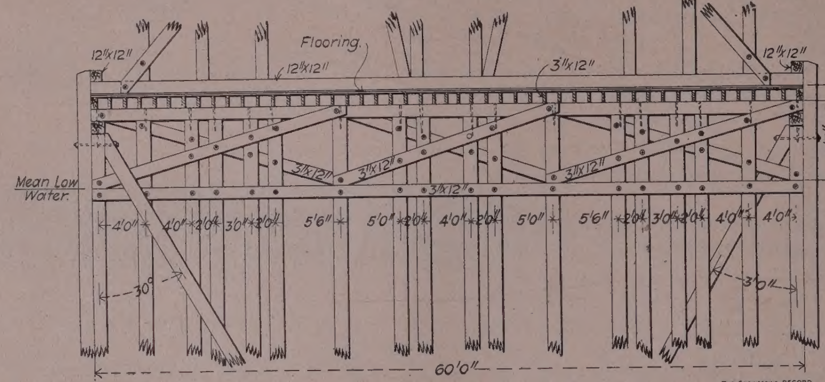
The main roof trusses are of modified Fink type, supported on the tops of the inclined wall columns and kneebraced to them from the first panel points of the lower chord as indicated in the elevation. The T-shape top chords have the lower edge of the vertical web plate stiffened by a pair of small flange angles, making the cross section resemble an I with unbalanced flanges. The wall columns have I-shaped cross sections and their web plates are cut short at the upper ends so that the top chord connection plate can be riveted between the column flange angles and be integral with both column and truss, forming both the end section of the top chord web and the connection for the end diagonal member in the truss. All the truss members were shipped separately, assembled and riveted on the deck of the pier and erected with traveler towers.

There are seven lines of purlin trusses kneebraced to those members of the trusses which are normal to the top chords. Jack-rafter 5-in. channels 4 ft. apart are supported on the top flanges of the purlins and have 2 x 4-in. strips bolted to them on which the 1¼-in. matched spruce roof sheathing is nailed and covered with Ehret's slag roofing. The sides and ends of the building are covered with No. 20 galvanized iron with 2½-in. corrugations. The large rolling doors are made with Kinnear No. 2 interlocking steel slats of No. 18 U. S. gauge galvanized steel. The roof openings are covered with Rendle's Paradigm Duxbac ventilating skylights.

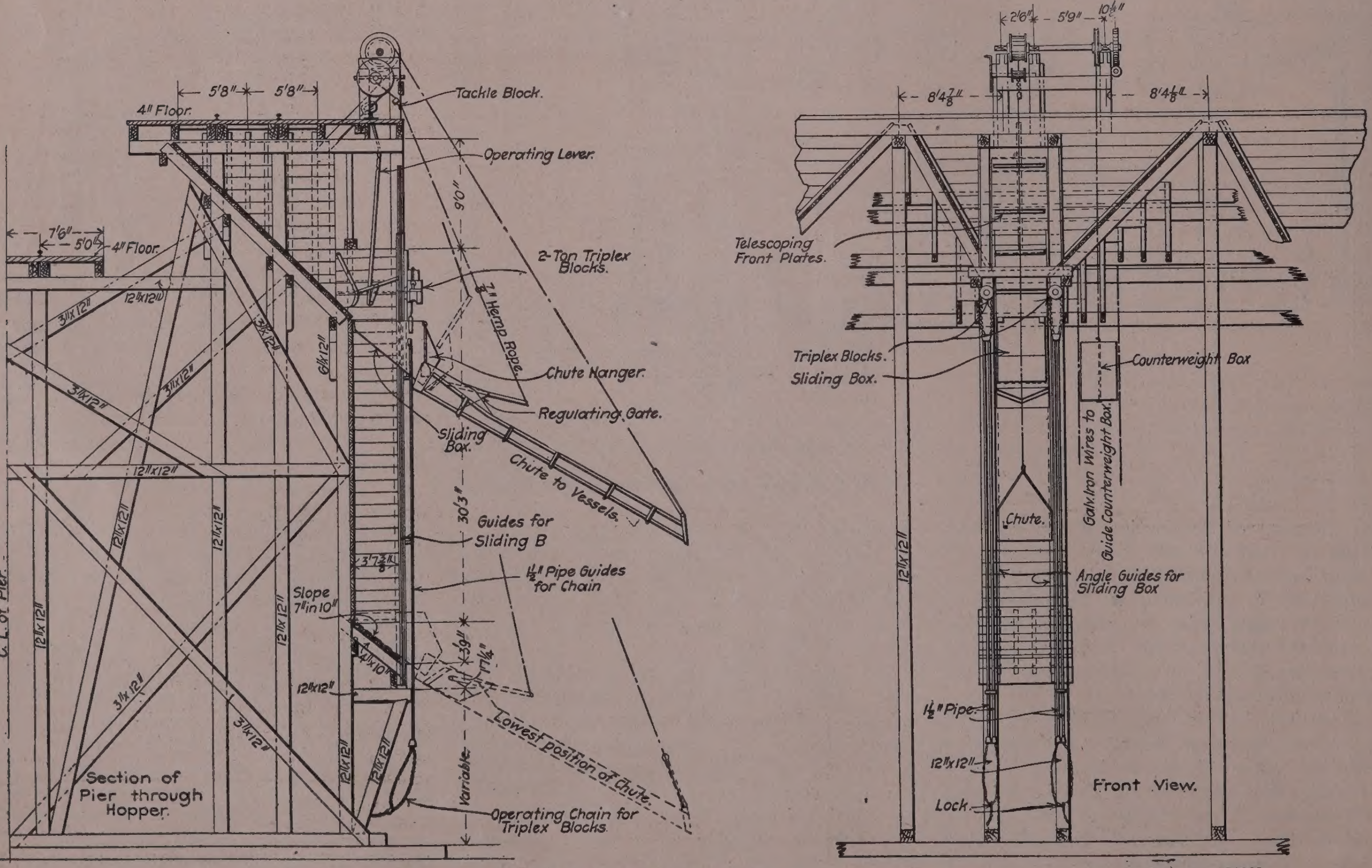
Adjacent to the coal pier there is a transfer bridge for loading coal cars on floats to deliver them to vessels in the harbor. The bridge has a double track platform about 52 ft. long, which is carried by two wooden trusses, pivoted at the shore ends and suspended at the river ends from overhead cantilever trusses in the same planes. The cantilever trusses are fulcrumed to overhead transverse trusses, which are supported on groups of piles outside the platform. The platform is suspended by chain tackles from the short arms of the cantilevers, and the long arms of the cantilevers are counterweighted so accurately that they are nearly balanced and the outer



Half Elevation of Freight Shed Bent.

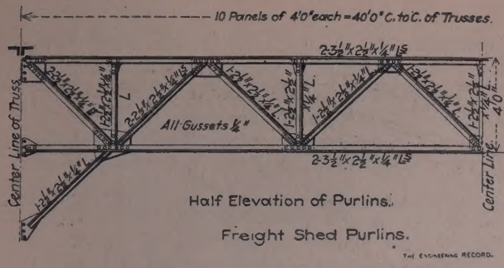


Transverse Elevation of Pile Bent for Coal Pier.



Coal Bin and Movable Loading Chute.

FREIGHT SHED SUPERSTRUCTURE, COAL PIER PILING AND COAL BINS AND CHUTES OF THE BALTIMORE TERMINAL.

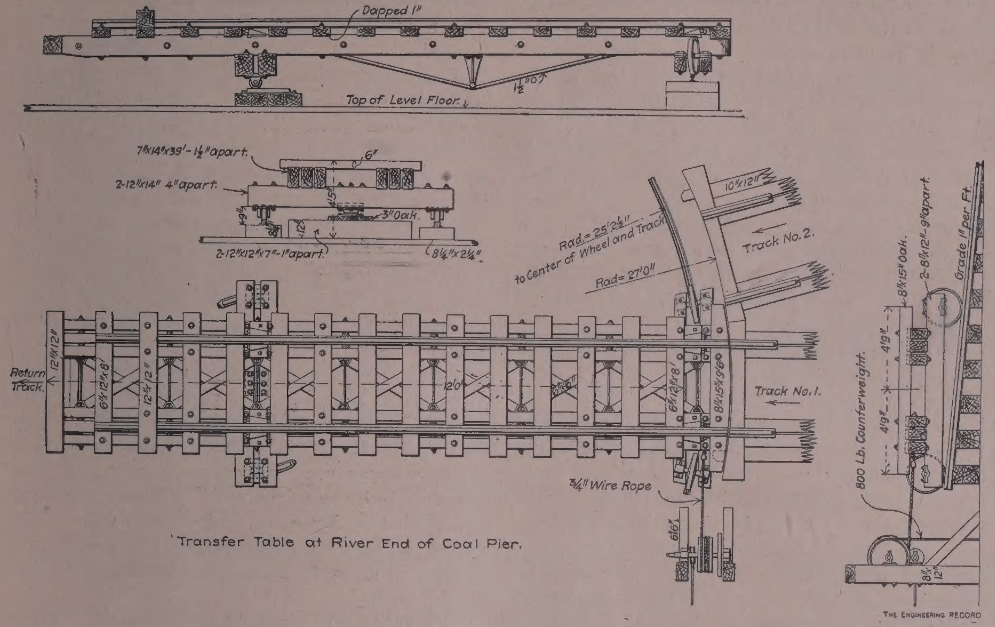

10 Panels of 4'0" each = 40'0" C. to C. of Trusses.
All Gussets ½"
Center Line of Truss
Center Line
Half Elevation of Purlins.
The Engineering Record.

Freight Shed Purlins.

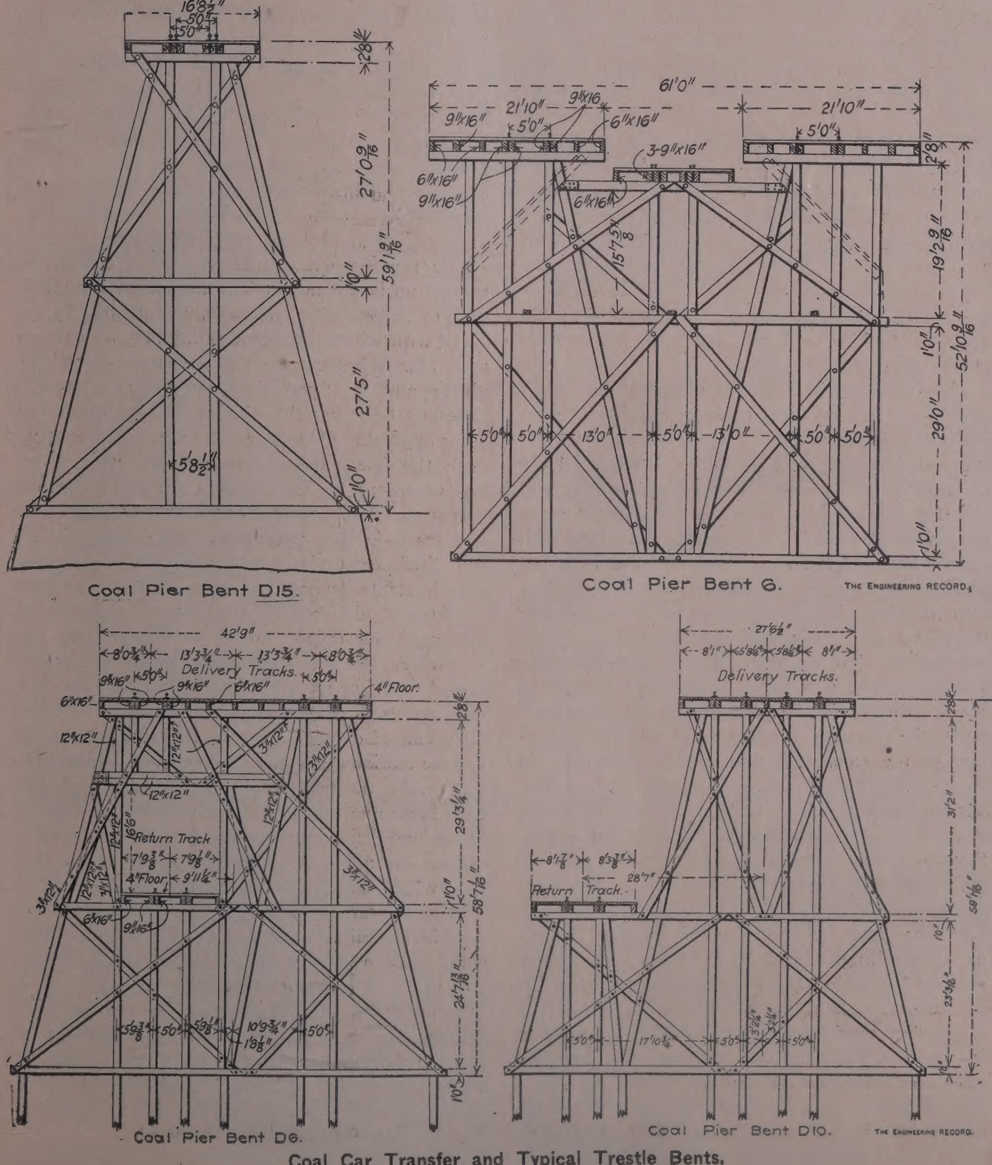
ends of the platform can be raised or lowered with very little effort.

The principal quantities involved in the terminal construction include 1,012,641 lb. of steel in the freight shed, 107,793 lin. ft. of yellow pine piles in the coal pier, 207,521 lin. ft. of piles in the freight pier, 13,822 lin. ft. of oak piles in the freight pier, 6,703 lin. ft. of oak piles in the coal pier, 115,400 lb. of bolts and castings in the coal pier and 120,600 lb. in the freight pier, 2,282,107 ft. b. m. of decking in the coal pier and 1,233,220 ft. in the freight pier and 1,012,641 lb. of steel in the freight pier house, about 2,381,000 lb. of steel in the bridges, and 15,000 cu. yd. of concrete, made with Dragon and Lehigh Portland cement in the sub-structures.

The work was designed and the construction supervised under the direction of the engineering department of the Western Maryland R. R., Mr. J. Q. Barlow, chief engineer; Mr. J. W. Galbraith, principal assistant engineer in charge; Mr. T. D. Claiborn, resident engineer for the western part of the work; Mr. W. AtLee, resident engineer for the eastern part of the work, and Mr. C. M. Wilkinson, chief draftsman. Mr. Virgil G. Bogue, New York, was consulting engineer, and most of the bridge plans were made by Mr. A. W. Buel, Engineer of Bridges and Buildings. The Degnon Contracting Co., New York, was the contractor for all grading, masonry and pile driving and for the construction of the coal pier, the Baltimore Bridge Co. was the contractor for the freight shed, and the Pennsylvania Steel Co. was the contractor for all bridge superstructures.



Transfer Table at River End of Coal Pier.



Coal Pier Bent D15. Coal Pier Bent 6. Coal Pier Bent D6. Coal Pier Bent D10.

Coal Car Transfer and Typical Trestle Bents.

Test of a Producer, Engine and Pump.

At Poughkeepsie, N. Y., there is an interesting pumping plant, comprising a 50-h.p. suction producer made by R. D. Wood & Co., a 35-h.p., vertical, two-cylinder gas engine made by the Westinghouse Machine Co., and a Worthington belted, 10-in., volute pump with enclosed impeller 28 in. in diameter, driven at 450 r.p.m. The distance between the centers of the pulleys is 28 ft.

The tests were made by a water meter measuring a fractional part of the total flow through a by-pass in the delivery pipe. The ratio of the quantity recorded by the meter to the total discharge was ascertained by allowing the entire amount to enter two water-tight basins, having a combined area of 28,853 ft., and noting the rise in them by means of hook gauges reading to 0.001 ft. The pressure gauge on the discharge pipe was tested by a water column 25 ft. high and found to register 1.36 ft. too much.

The combined efficiency of the belt and pump was determined by ascertaining the brake horsepower of the engine and dividing the power due to the volume pumped and the total lift by it. The separate efficiency of the belt and pump is estimated. The brake test gave 38.8 h.p. when the engine was operated at full power.

The test of the entire plant, using anthracite pea coal, gave the following results: Total cubic feet of water pumped in 24 hours, 427,856; pounds pumped per minute, 18,521; delivery head, 21.5 ft.; suction head, 17.03 ft.; net water horsepower, 21.62; combined efficiency of pump and belt, 0.557; total coal consumed, 1,151 lb.; coal consumed per horse-power-hour, 1.23 lb.; duty of entire plant, 89,211,691 ft.-lb. per 100 lb. coal. These figures are furnished on the authority of Mr. Chas. E. Fowler, superintendent and engineer of public works.

THE NEW TRANSPORTER BRIDGE between Widnes and Runcorn, England, is a suspension structure with its stiffening truss high enough to permit vessels to pass below. As the shores are low it was impracticable to reach the grade of the lower chords, and the latter accordingly form a track from which a transporter platform, 55 ft. long and 24 ft. wide, is suspended. This is moved across the bridge by a 35-h.p. motor taking current at 500 volts from insulated trolley wires carried on the bottom bracing of the truss. The current is furnished by generators driven by gas engines. The structure is fully described in "Engineering," and was built by the Arrol Bridge & Roof Co. from the designs of Messrs. J. J. Webster and J. T. Wood.

Operating Features of Vertical Curtis Steam Turbines.

A paper read before the National Electric Light Association by August H. Kruesi.

Balance.—The very considerable experience already had with turbines has fully demonstrated the claim that they require far less attention and adjustment than reciprocating engines to insure continuous and uninterrupted service. As a consequence of their high speeds, however, the centrifugal forces acting on the rotating parts are of greater magnitude than those which occur in reciprocating engine units, and one of the important features of successful operation of turbine driven units is the maintenance of a good running balance.

The first essential for good running balance is a good alignment of the top bearing with respect to the shaft. This can be readily determined by removing the top bearing and shifting the top bearing shield of the generator if necessary. Adjusting devices are provided for this purpose. The shaft should run true and the bearing shield should be concentric so that the maximum eccentricity will not exceed from 0.002 to 0.004 in. in turbines from 500 to 5000 kw. capacity respectively. It is comparatively easy to secure such freedom from vibration in all sizes of turbines that a one cent piece will stand on edge at the top of the machine indefinitely and after having been brought to this condition when first started the machine will require little further attention on this account. A liberal flow of oil through the bearings is desirable both for its cushioning effect and for the sake of lubrication. The balance cannot be considered final until after the machine has been thoroughly heated and remains unchanged. The balance being good, there is practically no load on the guide bearings and consequently practically no wear. Although it is important that the alignment be good, close clearance in the bearings is not necessary provided the lubrication be ample.

Bearings and Lubrication.—The generator bearings require the same attention as would be given to ordinary dynamo bearings. The middle bearing on account of heat conduction through the shaft from the turbine runs warm but with perfect satisfaction because of the light loads imposed upon it by the vertical shaft.

The oil is fed to a reservoir with sight-feed glasses mounted at the top of the generator and also provided with an overflow pipe leading to the drain. To insure a full reservoir the supply is adjusted to cause a slight overflow. From the sight-feed glasses independent pipes supply oil to the two upper bearings under a sufficient gravity head to insure perfect lubrication under all circumstances.

The quantity of oil required for the top and middle bearings of turbines of various sizes is given in the accompanying table:

Amount of Lubrication Required by Bearings.

Upper bearings			Step bearings			
Kw.	Speed.	Gals. oil per min.	Step press.	Baffle press.	Pump press.	Gal. oil per min.
500	1800	0.38	180	45	225	1.0
800	1500	0.38	180	45	225	1.5
1000	1200	0.50	380	95	475	3.4
1500	900	0.50	392	100	490	3.4
2000	750	0.50	420	105	525	3.4
3000	600	0.75	520	.130	650	3.4
5000	500	0.75	640	160	800	6.0

This oil flow includes a reasonable amount of overflow and requires a continuous oiling system, generally comprising a pair of steam-driven duplex oil pumps, a drain tank, and an overhead gravity tank, supplied with the turbines. The tanks are designed so that the oil contained in the pipe system cannot cause flooding and so that the steam-driven pumps may always be run at such a speed as to always keep the upper tank filled, the surplus oil returning through an overflow. The tanks contain strainers, but are not filters, and a separate filter connected in series with the return pipe from the upper bearings is always desirable. The oil in its passage through the bearings is not exposed directly to the air, but a gradual discoloration and collection of grit is inevitable.

Step-Bearing.—To eliminate the packing at the lower end of the shaft, the step bearing is generally water-lubricated, the shaft being fitted with a bronze sleeve running in a babbitt-lined guide bearing. With water lubrication no attention is required beyond running the pressure pump, which may supply one or a number of turbines, the division of the water being automatically cared for by the baffler, the purpose of which is to make turbines of the same size or different sizes take their proportional share of the total flow of lubricant supplied by the pumps. This baffler is supplied with every vertical steam turbine and is a fluid friction device of simple construction and readily adjustable to give any pressure drop desired. By its use it is possible to operate turbines of 500 kw. and 5000 kw. output from the same pumps and piping system economically and satisfactorily under every condition.

The water used for the lubrication of the step bearing and guide bearing is ordinarily permitted to flow over into the condenser and so on to the hot-well and feed-water tank, from which water is again taken for the step bearing pumps so that the operation of the step bearing neither adds water to the boiler feed system nor subtracts it therefrom. If more convenient it may, of course, be taken from any other source. The water so used is only a small percentage of the total amount required for the turbine at full load and will generally be less than the amount of "make-up" required. When running non-condensing it may be drained direct from the step bearing if desirable.

Since the bafflers used in series with each step bearing are designed to give a large drop in pressure (about 25 per cent. of the step-bearing pressure) there is no object in reducing the pressure drop in the piping, which may be proportioned for a velocity of 500 ft. per minute, and will never require larger mains than 1½-in. pipe, extra heavy galvanized iron. The branches to turbines should be ¾-in. to have sufficient strength, independent of the pressure they carry.

The step bearing is usually supplied with lubricant under the requisite pressure by duplex double-acting steam pumps of standard pattern, and generally each of sufficient size to supply all the turbines in the station. This mode of supply and the step bearing itself have proved entirely satisfactory and reliable. No machine involving such speeds and weights as are encountered in steam turbines can depend on natural lubrication. The step bearing, however, has shown remarkable sturdiness when subjected to cessation of forced lubrication. To illustrate this a test has been made in which a 500-kw. turbine was run up to speed, lubricant and steam turned off simultaneously, the turbine brought to rest due to the friction of the step, and immediately re-started six times in succession without difficulty of any kind. After raising the step by means of the adjusting screw to compensate for the wear of the plates, they were just as good for further service as at the beginning, although naturally somewhat grooved.

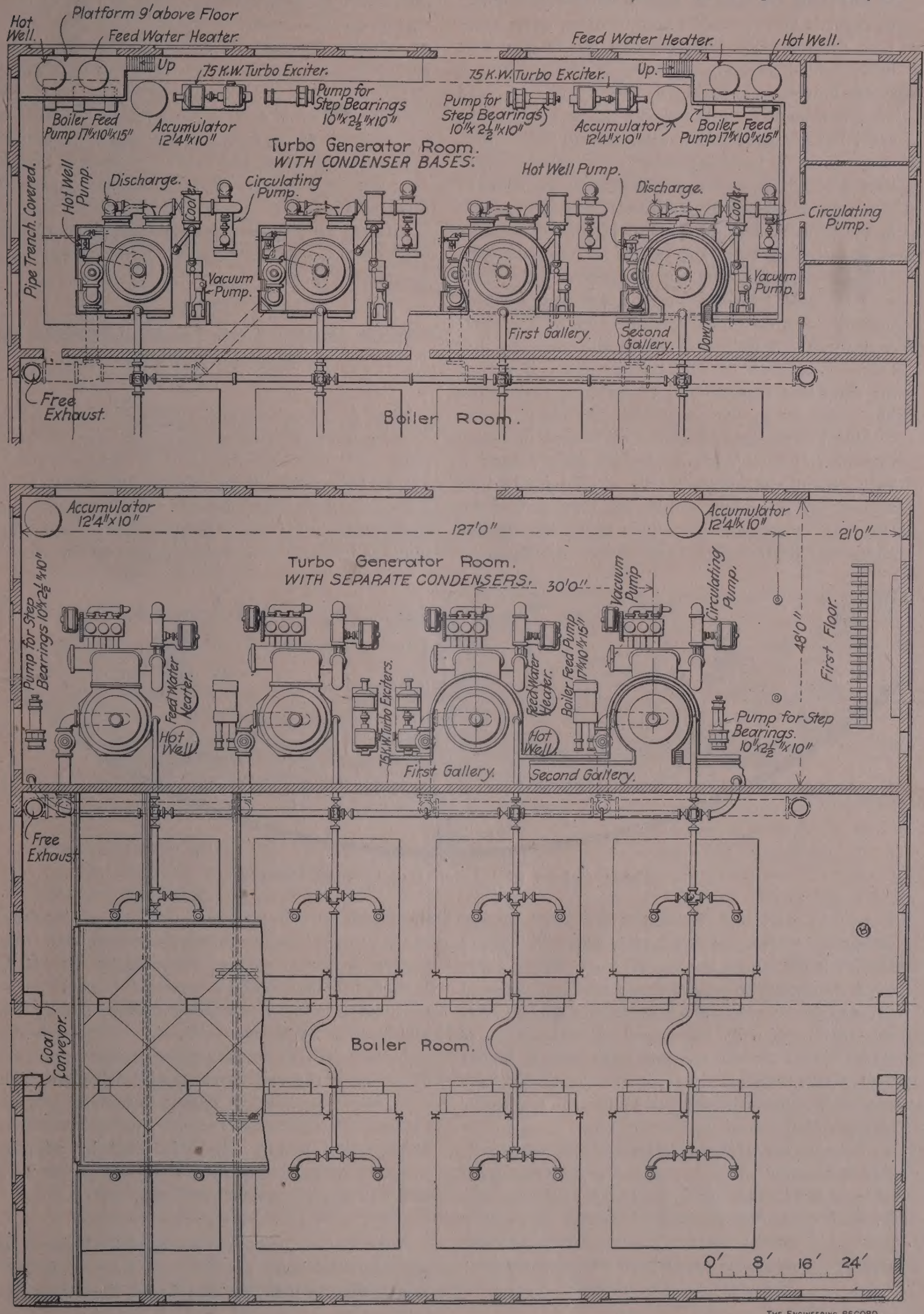
Valves and Governor.—The needle valves, or controlling valves, by means of which each of the main valves are opened or closed, as has been repeatedly described, require in some of the earlier machines occasional regrinding when the main valves open slowly. This difficulty has since been overcome by experiment and the selection of more suitable materials for the service and by the use of steam chests of cast steel to avoid warping under the influence of highly superheated steam. With a view to still better operation, various forms of mechanically and hydraulically operated valves are under test in service conditions. The mechanically operated valves derive their motion from the turbine shaft under a fixed period, depending upon the turbine speed and, therefore, have no tendency to accumulate changes in speed or cause hunting. The governor controls the number of valves to be opened or closed by a modified Corliss release mechanism. The hydraulically operated valves are positively opened and closed by a cam shaft under the control of a hydraulic cylinder, the piston of which connects with a follow-up attachment which makes it absolutely non-hunting. The type of valve mechanism which will ultimately prevail as the simplest and most satisfactory can only be determined by practical experience which is now being had in turbines under various conditions. It is desirable that the valve casings be drained to the casing of the turbine to avoid pocketing of water when the machine is at rest, so that it can be started and the load quickly applied in case of need.

The governor may readily be set for any desired speed and degree of regulation within reasonable limits by simple adjustment of the tension and characteristic of its spring. It is customarily set for 2 per cent. regulation between no-load and full load. Engines which regulate within 2 per cent. are, however, seldom met with. The very large fly-wheel effect of the turbine generally enables it to exert a steadying influence on the whole system.

Clearance.—The amount of clearance given between the stationary and revolving parts has been fixed by extensive experience and is made sufficient to satisfy the most exacting practical requirements. For example, instantaneous loads have often been applied to a 2000-kw. turbine, by means of an oil switch, amounting to 50 per cent. overload, both condensing and non-condensing, and instantaneous loads of from 7500 to 8000-kw. have been thrown off and on a 5000-kw. machine repeatedly with perfect freedom.

The rapidity with which the machine may be started up is not in any way limited by the clearance of the machine and is only controlled by the speed with which the steam piping may be warmed up. This depends upon the judgment of the engineer and no fixed time can be set. It will generally be found that the auxiliary engines and other apparatus determine the time. This is especially the case where superheaters are used, it being necessary to use some caution in opening valves to avoid heavy doses of water previously condensed in the superheater tubes, steam pipes, etc. Such accumulations of water are always possible in steam headers and pipes having dead ends or sluggish circulation and point to the need of separators for engine driven auxiliaries and just as careful means for draining piping for superheated steam as would be provided if superheaters were not used. Sudden doses of water have sometimes caused damage to the auxiliary apparatus in turbine stations, but have never caused trouble to the turbine proper except when water came in such large quantities as to prevent the flowing of steam and thus momentarily slowed the machine down. As a rough guide it may be stated that 500-kw. machines have been started up from a cold condition, synchronized, and made to carry load in six minutes times. Certain 1500-kw. machines have frequently been started, synchronized, and made to carry load in three minutes. It is in general desirable to start up the turbines condensing, that is, with the circulating water in flow and the air pump running so as to have a vacuum while the turbine is being brought up to speed as the amount of steam and the time of acceleration are thereby very much reduced.

Auxiliaries.—The multi-stage construction of the turbine affords the facility, which has been made use of in some cases, for abstracting steam, after being partly expanded, for feed-water heating and other similar purposes. The steam so expanded in the turbine is more economically used by the turbine than by most types of engine-driven auxiliary apparatus and so offers an economical means for making use of electrically driven auxiliaries, which are generally more desirable on account of less cost of attendance and maintenance without the disadvantage usually incidental to electrically driven auxiliaries, namely, insufficiently heated feed-water. It is possible to build small turbines of the Curtis type which will yield exhaust steam for feed heating even more economically (for the reason that the pressure in the main turbine varies with the load), and such machines are frequently employed as exciters. Their simplicity and reliability, combined with the absence of lubricating oil in the exhaust, making it possible to use open feed heaters and waste no water, will no doubt create a demand which will justify their development for driving centrifugal circulating pumps, hot-well pumps, feed pumps, etc. Means are at hand for simply and automatically varying the speed of such turbine driven pumps according to the load on the main turbine.



THE ENGINEERING RECORD.

Typical Turbine Plants with Condenser Bases and with Separate Condensers.

Condenser Bases.—Condenser bases have been designed for all sizes of turbine from 500 kw. to 5000 kw., and several have been in successful operation for some time past in connection with 2000 and 5000 kw. machines. The 500 kw. size has a cooling surface of 1800 sq. ft., the larger sizes 4 sq. ft. of surface per kilowatt, all with four passes. While no direct comparisons have so far been possible, the indications are that this arrangement gives a better vacuum under given conditions than the separate condenser, as would naturally be expected from the shorter and more direct path of the steam and larger exposed area of tubes directly under the last wheel.

The condenser base effects some saving in floor space, although this is generally determined in a large measure by the type of auxiliary apparatus employed, and gives a more convenient relation of gallery and floor levels, eliminating the basement and in this way tending to reduce the attendance required. The cost of a turbine with condenser base is substantially the same as that of a turbine together with a separate condenser. Any type of auxiliary apparatus may be used with the base condenser and the auxiliaries will cost about the same in either case. The accompanying diagrams show plans of turbine installations with and without condenser bases.

Low and High Pressure Turbines.—A number of turbines are now under construction, designed to work at an initial steam pressure of 15 lb. absolute, and expanding to the best vacuum obtainable, taking steam at this initial pressure from the exhaust of reciprocating engines in plants already built, but operating non-condensing. The energy available between these pressure limits is approximately equal to that due to the drop in pressure in the engines and the turbine may be expected with a 27-in. vacuum to develop a kilowatt hour for about 42 lb. of steam, so that the output of the engines will be equalled and the station capacity and output doubled, if low-pressure turbines are installed of the same rated capacity as the engines, without adding to the equipment of boilers, high pressure steam piping, etc., and without increasing the coal consumption. The turbines receive only what steam is exhausted by the engines and their output will, therefore, vary in the same degree as the load on the engines, the turbines floating on the system and contributing as much power to the total station output as the amount of steam supplied by the engines makes available. The amount of steam taken from the boilers is then controlled solely by the cut-off of the reciprocating engines. Since the no-load steam consumption of the turbines will be less than that of engines of the same output, the turbines will never be a drag on the engines.

Turbines operating at the other extreme of the steam expansion curve are also under consideration, taking steam at, say, 250 lb. pressure and expanding it to 110 lb. pressure, after which the steam is used for pulp digesters and other heating purposes. Since the whole of the latent heat of the steam is recovered by such a process, and as it would be nearly all lost if exhausted into a condenser in the ordinary way, such operation is very economical, the electrical output of the turbine being obtained by an altogether insignificant addition to the coal consumption which would be required for heating alone. The amount of energy made available per pound of steam through this range in pressures is relatively small, but can be economically made use of in the type of turbine under discussion and by a machine of reasonable size because of the small volume and high density of the steam. For the same reason the number of turbine parts is small and while the exhaust pressure and, therefore, the shell pressure is very high, all difficulty on account of shaft packing is completely eliminated by a modification of the water step bearing already referred to above.

Steam Piping.—To conform with prevailing practice based on steam engine experience, the steam pipes for Curtis turbines have been proportioned for a steam velocity of about 6,000 ft. per minute at full load, non-condensing. Economy both in capital cost and in operation, however, makes small piping desirable and there are a number of reasons why the whole of the steam piping for turbine stations should be designed on a different basis. The low velocity mentioned is probably well suited to engine work, to avoid vibration of the piping due to the pulsations in flow of the steam and which do not exist in the case of the turbine, and to hold the pressure drop within the economical limit imposed by the engine, and give the full pressure up to the point of cut-off. The turbine, on the other hand, takes steam continuously and the maximum flow is the same as the average. A reduction in pressure below that for which the engine cylinder and cut-off dimensions are designed causes a larger increase in steam consumption than in the case of the turbine, whose mode of operation makes it more flexible in this respect. An increase in the pressure drop allowed between boiler and turbine is even more justifiable when the steam is superheated, in order to reduce radiation losses, and involves no increase in initial cost, boilers costing substantially the same whether built for 150 lb. or 200 lb. The mere increase in pressure from 150 lb. to 175 lb. by gauge, reduces the volume by 12 per cent. and permits a 6 per cent. reduction in the diameter of pipes. It therefore seems desirable to make the rated boiler or safety valve pressure about 25 lb. higher than the rated turbine pressure and permit a certain variation in pressure under extreme conditions, and correspondingly less for normal load, etc., thereby reducing the size of the pipes and fittings and materially reducing the cost of the piping, securing drier steam, avoiding the frequent blowing of pop-valves and, incidentally, another important advantage, namely, less trouble from leaky steam joints, especially when superheated steam is used. It is sometimes found that the only satisfactory joints in turbine plants are those on the turbine itself, pointing to the need of heavier flanges and bolts. The dimensions of the turbine flanges, designed by W. A. Pearson, have been proved satisfactory by years of experience. Leaky joints on fittings are probably sometimes due to the warping of cast-iron on account of its want of elasticity and extreme expansion under superheated steam. Valve bodies of steel castings and valve seats of nickel bronze (approximate composition, copper, 77; tin, 10; zinc, 4; nickel, 9) are unquestionably superior for such work.

Much of the difficulty with pipe joints is no doubt due to insufficient elasticity and provision for expansion and this can be largely overcome by the use of the smaller piping here advocated by reason of the fact that the flanges and bolts of small pipes are relatively stronger than those of the larger sizes and because flanges on small pipes are subjected to smaller forces tending to spring them and open the joints for the reason that the forces set up in the pipe bends, used to afford flexibility, are relatively much smaller for the smaller sizes of pipe.

The expansion of the pipes is inevitable, and is the same regardless of the size of pipe, but the force brought to bear on the flanges and fittings of a 6-in. pipe will be about four times as great as those for a 4-in. pipe and two and one-half times as great for a 12-in. pipe as for a 9-in. pipe. An example may be of interest: The station plan already referred to shows four 450-hp. boilers connected in the most direct manner to a 2,000-kw. turbine. We may consider that the boilers would ordinarily have 6-in. nozzles, that 8-in. pipe would be used to carry the steam from two boilers, enlarging to 10 in. to carry that for the four boilers, uniting with a 12-in. header and continuing 10 in. in diameter to the turbine. As an extreme case these may be compared with pipes 4, 5, 7, 9 and 7 in. respectively, according to the accompanying table.

Comparison of Steam Pipe Sizes.

	Low.	High.
Nominal sizes of pipes, extra heavy...	6, 8, 10, 12, 10	4, 5, 7, 9, 7
	Velocity	
Velocity in pipes to turbine at normal rating of boilers, saturated steam 175 lb. gauge pressure	3000 3400 4200	6800 8500 8700
Approx. pressure drop * boiler to turbine, lb.	2.5	9.0
Approx. radiation losses†, saturated steam, 2½-in. covering, B.T.U. per min.	566	396
Approx. radiation loss, 100 deg. superheat, 3-in. covering, B.T.U. per min.	710	496
Estimated cost of valves, fittings and pipe, all steel, and pipe covering, for one 2000-kw. turbine..................	$2900	$1830
Estimated saving in first cost of these materials	——	$1070

*Carpenter, Trans. A.S.M.E., 1899.
†Stott, Assoc. Ed. Ill'g Co.'s., 1902.

For steam superheated 100° F. above 175 lb. gauge pressure, the volume will be increased about 15 per cent., but this amount of superheat will reduce the steam consumption of the turbine about 10 per cent. so that the velocity would be only about 5 per cent. greater than for saturated steam carrying the same load and the piping system would be equally suitable for either as regards velocity and pressure drop. The pressure drop for the high velocity piping can only be regarded as approximate. It is based on a steam flow corresponding to 25 per cent. overload on the turbine and represents some loss of energy, but probably not a total loss of the energy corresponding to the pressure. It seems likely that most of the energy represented by drop in pressure will be converted and become available in the form of a slight amount of superheating or evaporation of entrained moisture. This conclusion seems reasonable since whatever loss there may be must take the form of heat and furthermore it requires a fixed amount of work to transport the given weight of steam the required distance regardless of the velocity. If, however, the drop in pressure is all charged up against the high velocity piping as a loss of energy in the turbine at the rate of 0.05 lb. increase in water rate at full load per pound drop in pressure, a very liberal allowance, it will still be found that the net operating cost will be less than that of the low velocity piping, if credit is given the smaller piping for its lower radiation losses, which occur 24 hours a day, and if credit is given the smaller piping for the saving in interest, depreciation and repairs it effects on the capital cost, taking these fixed charges at 10 per cent. and the load factor at 33 per cent. Coal is taken at $2.50 a ton and the evaporation of 9 lb. per pound of coal. This, as stated above, is an extreme case and a higher load factor, higher price for coal or a few unavoidable elbows in the pipe line will materially increase the size of pipe and fittings.

Steam Consumption.—Although somewhat outside the scope of this paper, the accompanying table of tests, made by A. R. Dodge, Schenectady, N. Y., is presented as being of interest in showing the improvements constantly being effected in this turbine by extensive experiment and development.

Tests on 2,000-Kw. Turbine.

Date, 1905.	Reference letter.	Kw. load.	R.P.M.	Flow lb. per hour.	Initial press by gauge.	Abs. back press. in. merc.	Vac. referred to 30-in. bar.	Super-heat deg. F.	Lb. steam per kw. hr.
4-27	A	1970	918	29800	162	1.85	28.15	210	15.12
5-3	B	1040	928	16500	167	1.62	28.38	190	15.87
5-3	C	560	930	10000	163.5	1.60	28.40	210	17.86
5-3	D	2005	918	31700	169	1.63	28.37	125	15.80
5-3	E	1066	928	17400	171	1.52	28.48	105	16.33
5-2	F	1970	918	31900	165	1.79	28.21	105	16.20
5-3	G	0*	932	1530	165.5	1.95	28.05	157	...*

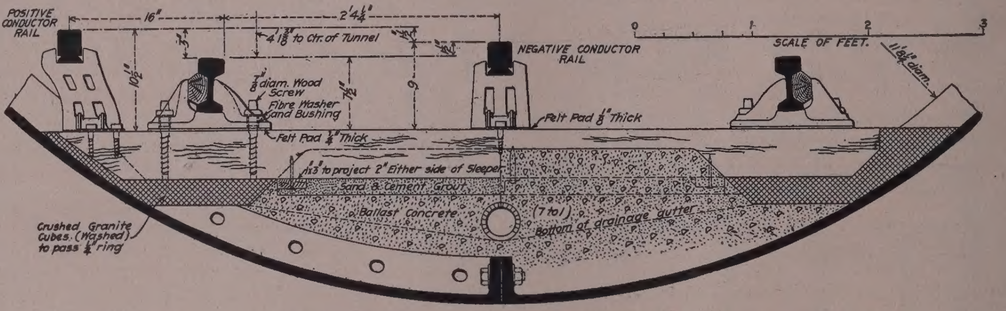
*No load, with field.

The tests were made on a 2,000-kw., four-stage turbine of essentially the same design as machines built two years ago, but ran at a higher bucket speed and embodying improvements in buckets, nozzles, etc., which when incorporated in machines designed hereafter will give the same or better results.

It can be shown that the saving in capital cost alone between turbine and engine-driven units effects a saving in fixed charges equivalent to a large reduction in the water rate. The saving of the condensed steam by the turbine, where feed water must be bought at ordinary city rates, is also considerable, as is that effected by the less attendance necessary for the turbine. All of these considerations, however, are of minor importance as compared with the reduction in steam consumption indicated by these tests because there is hardly any part of the equipment of a power station whose capital and operating costs cannot also be reduced as a direct result, such as boilers, stack, coal handling apparatus, condensers, pumps, etc.; or, in other words, a reduction of 10 per cent. in the water rate of the turbine means a station of 10 per cent. greater capacity and output for the same investemnt, fixed charges and operating expense.

Track Construction, London Underground Electric Railway.

The deep-level "tube" lines of the London Underground Electric Railway Co. are all being built with cast-iron linings at a depth of 30 to 185 ft. below the surface, averaging about 70 ft. The permanent way, shown in the accompanying illustration, is of the standard British type with bull-head rails. The main feature of interest is the location of the conductor rail. Two insulated rails, positive and negative, are used, and their section is similar to that designed by Mr. W. B. Porter, of the General Electric Co. It is of rectangular section, with dovetails at the bottom, and weighs 85 lb. per yard. The groove is employed to provide an easy and satisfactory method of securing the rails by a special fish-plate. The rails are guaranteed to have a resistance not exceeding 6.4 times that of an equivalent copper section, and this condition is filled by adopting a metal with 0.05 carbon, 0.19 manganese, 0.05 sulphur, 0.05 phosphorus and 0.03 silicon.



Track Details of London Underground Railway.

A Four-Cell, Sixty-Ton Refuse Destructor has recently been put in operation at Gorton, England, in which the supply to the steam jets that create the forced draft is automatically cut off when the clinker doors are opened and is turned on again when these doors are closed. The cells are of the Horsfall type, each with 42 sq. ft. of grate area, and a drying hearth within the cell. The fumes from the drying refuse are passed over the hottest part of the fire, and, the Surveyor states, they are then led away by a special flue. The steam jets in the blowers are arranged so as to draw the fumes from the upper part of the furnace arch. The air for the blast is brought in through cast-iron boxes in the sides, which protect the side walls immediately above the grate bars and also heat the air, thus providing a hot blast.

Formulas and Computations for Horse-Power Value of Streams.

By W. L. Church, Boston, Mass.

The following paper has a two-fold object: (a) to derive some condensed formulas for the rapid estimate of the discharge value of a given drainage area, and (b) to illustrate and simplify the method of computation of the value of a drainage area in connection with partial storage and steam auxiliary.

The following is the notation employed:

D. A. = Drainage area in square miles.
H.P. = Horsepower (on 24-hour basis) from *D. A.*
h' = Working head in feet.
e = Percentage of efficiency of wheels.
cfs = Cubic feet per second average run-off from 1 sq. mile.
CFS = Cubic feet per second average run-off (annual or monthly as the case may be) from total *D. A.*, assuming complete storage and utilization.
rf" = Rainfall in inches (annual or monthly).
% = Percentage of rainfall appearing as run-off.
ro" = Run-off in inches (annual or monthly), whence *r o"* = *rf"* x %.

No. cu. ft. of water per sq. mile for 1-in. rainfall, 2,323,200 cu. ft. No. seconds in one month, 2,592,000. No. seconds in one year, 31,104,000.

Formulas (1), (2) and (3) following are merely condensed from the familiar formula:

$$H.\text{-}P. = 62.5 \text{ x } cfs \text{ x } 60 \text{ x } h' \text{ x } 0.8 \div 33{,}000,$$

in which the efficiency of the wheel is introduced as 80 per cent.

Whence

$$H.\text{-}P. = cfs \text{ x } h' \div 11 \ldots\ldots\ldots\ldots (1)$$

$$cfs = 11 \text{ x } H.\text{-}P. \div h' \ldots\ldots\ldots (2)$$

or for 1 *H. P.*,

$$cfs = 11 \div h' \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The fundamental formula is, of course, familiar to the veriest tyro in engineering, but I have noticed that frequently no attempt is made to take advantage of the more compact formulas that can be deduced when the usual wheel efficiency of 80 per cent. is introduced.

The government reports as published in the Irrigation Papers are generally resorted to for determining the available horse-power from a given stream. These reports, however, do not carry in the minds of all engineers the weight which their authority would imply. This is not due to any defect in the methods or intentions of the government hydrographical surveys, but arises merely from the fact that the rating tables are necessarily scaled from a curve which is approximately established by a comparatively few measurements taken for different gauge readings.

Moreover, the engineer is frequently called upon to estimate the value of a stream on which neither the government nor any private concern has established gauging stations. It is obvious that no single gauging, or even a series of gaugings for any one year, affords adequate data for the safe estimate of a stream. It is believed, therefore, that fully as close an approximation to the facts can be secured by a consideration of the extent and character of the drainage area, in connection with general data for rain-fall and percentage of run-off derived from independent but reliable sources. A calculation on this basis can be used either to check the government gaugings where available, or to primarily establish the value of a stream in default of any other data.

The usual data at command are the rain-fall in inches, and the percentage of rain-fall appearing as run-off. The drainage area can be laid off on the government topographical charts, which now cover a large portion of the country; or, in default of these, can be closely approximated from the ordinary standard atlas. If the rain-fall has not been measured on the precise area under consideration, it will often be found that records of rain-fall have been maintained for a series of years either at a government or private station or some adjacent point nearly enough related to the area under consideration so that the record can be considered as transferred to it.

As to the varying percentage of run-off there is nothing to my knowledge so extended and complete as the records kept by the engineers of the Croton Aqueduct Commission. These cover a long series of years and are presumably taken with unusual accuracy. The results are tabulated by months and show the total rain-fall for the month in inches, the measured run-off for the month, also in inches, and the percentage which the run-off bears to the rain-fall. As this record covers a wide range of precipitation from an annual rain-fall of 38 in. to one of 64 in., the engineer is at liberty to select from the table the monthly distribution of run-off by percentage in any year which corresponds mostly nearly to the character of the year under consideration. Thus for a year of extreme dryness the percentages for 1880 or 1895 would probably be considered. The dryest two consecutive years would probably be 1880 and 1881. If the general average was under consideration then the average of all the years recorded would be employed, and so on.

In this way, tempered always with good judgment on the part of the investigating engineer, the percentages selected from the Croton table combined with the rain-fall from the nearest local station can be made to serve a very useful purpose and with as close an approximation to probable accuracy as can be reached by any other method.

Formula (4) will be found convenient for a quick determination of the possible value of a given drainage area, assuming that all the run-off therefrom can be impounded and utilized. It is a valid objection that this condition of things can rarely be reached in practice. Nevertheless there is a constant tendency to increasingly appreciate the value of storage and to seek to realize it to the fullest possible extent; this, of course, more particularly with reference to the smaller streams, the storage of which can be fully controlled by the company developing them. It is not unwise therefore to use this formula in considering the potential value of a given stream in a year of average rain-fall, and then to attempt to create storage on such a stream not only adequate to equalize the flow of the average year, but to carry over the superfluous run-off in the year of excessive precipitation and distribute it upon a later year of deficient precipitation. We derive the formula thus:

$$cfs = 2{,}323{,}200 \text{ x annual } rf'' \text{ x } \% \div 31{,}104{,}000$$
$$= 0.0747 \text{ x } rf'' \text{ x } \%.$$

Total ro'' from $D.A. = CFS = cfs \text{ x } D.A.$

Whence by substitution in (1),

$$H.\text{-}P. = CFS \text{ x } h' \div 11 = 0.0747 \text{ x } rf'' \text{ x } \% \text{ x } D.A. \text{ x } h' \div 11$$

or finally,

$$\text{Annual } H.\text{-}P. = 0.0068 \text{ x } rf'' \text{ x } \% \text{ x } D.\,A. \text{ x } h' \quad (4)$$

But where storage is to be considered, or where a considerable portion of the power is to be sold as "secondary power," it is necessary to investigate the character of the stream by months. (Theoretically it should be investigated by days, but this is manifestly impractical.)

Starting with the same formula we substitute the monthly rain-fall in place of the annual and the number of seconds per month in the denominator. Reducing and substituting in (1) as before we have

$$\text{Monthly } H.\text{-}P. = 0.081 \text{ x monthly } rf'' \text{ x } \% \text{ x } D.\,A. \text{ x } h' \ldots\ldots\ldots\ldots (5)$$

The above investigation is so elementary that I almost apologize for introducing it. It is nevertheless a short cut and formulas (1) to (5) inclusive will be found very convenient to paste in the hat.

Lest there should be any misunderstanding of the convenient use of these formulas I will go through an illustrative example. The data on this example are substantially those of a case now in hand, but I have taken the liberty to introduce some modifications in order that a single illustration may cover all the various points likely to arise. In the case in point the drainage area is 371 sq. miles, and the power will be developed over three falls aggregating a total of 227 ft. working head. The stream has never been gauged. About 20 miles distant, however, there is a college that has kept an accurate record of rain-fall since 1889. During this period of 16 years the successive annual rain-fall varied from 32.61 in. in 1894 to 56.81 in. in 1897, the average for the 16 years being 44.73 in. No measurement of run-off was made at this station. We therefore fall back on the Croton record for the percentage of run-off in years of corresponding rain-fall. We find the minimum annual percentage of run-off to be 40 per cent. and the average for 24 years to be 50.16 per cent. (written in the formula, 0.5016).

We first would like to ascertain the value of this stream in the average year. Substituting in formula (4) we find the annual *H.-P.* on complete storage to be 12,845 h.-p. (24-hour basis). This result has no special value except as a stimulus to the development of as large a fraction as possible of a power so valuable and so favorably situated as to market.

The next step would naturally be to ascertain the distribution of power by months in the dryest year. For this we make use of formula (5) and note that as to this particular investigation *D. A.* and *h'* become constants. Reducing the constants of the formula it takes the shape

$$\text{Monthly } H.\text{-}P. = 6821 \text{ x } rf'' \text{ x } \%.$$

Arranged by months the year 1894 showed the following distribution of power:

Jan. 6,821 x 2.16 x .678 = 9,958 H.P.
Feb. 6,821 x 1.74 x 1.01 = 11,936 H.P.
Mar. 6,821 x 1.77 x .658 = 7,912 H.P.
April 6,821 x 1.83 x .516 = 6,411 H.P.
May 6,821 x 4.00 x .829 = 22,577 H.P.
June 6,821 x 3.13 x .398 = 8,458 H.P.
July 6,821 x 1.55 x .094 = 954 H.P.
Aug. 6,821 x 0.31 x .142 = 272 H.P.
Sept. 6,821 x 4.63 x .186 = 5,866 H.P.
Oct. 6,821 x 4.82 x .154 = 5,047 H.P.
Nov. 6,821 x 3.14 x .192 = 4,092 H.P.
Dec. 6,821 x 3.53 x .213 = 5,115 H.P.

The second column in the above is the rain-fall taken from the college station for the dry year of 1894. The third column is the percentage of run-off by months from the Croton table for the dry year of 1880. Note that the two years do not necessarily coincide. The combination of these two, being the minimum years selected from each record, is certainly a sufficiently drastic treatment to warrant confidence in the conservativeness of its results. The probability is that it does the power of this stream a distinct injustice, but the error is on the safe side. The average of the above is found to be 7,383 mechanical horse-power delivered from the wheel on a 24-hour basis throughout the year in a year of minimum precipitation, assuming that sufficient storage can be created to hold the spring flood and the especially heavy rainfall for May.

If such storage can be created and particularly if the reservoirs can be increased to such a capacity as to carry over the residual storage for possibly several years from a wet year to a dry one, it will be seen that the proposition becomes attractive.

The wide fluctuation from a maximum of 22,500 h.-p. in May down to a minimum of 272 h.-p. in August speaks eloquently of the commercial value of storage on a stream of this character; or what in a commercial sense approximates the same thing, namely, the policy of selling "secondary power" at a reduced rate. In this case, however, the measure of the "primary power" would be the trifling amount of 272 h.-p. in the month of August. A large volume of storage therefore is imperative and fortunately the topography is unusually favorable to this end.

In order to introduce all the conditions we will assume that the company is willing to put in an auxiliary steam plant of 3,000 h.-p. on the theory that its use will be limited to an occasional month or so in an exceedingly dry year, thereby enabling a much higher output of water power to be realized for say 90 per cent. of the time. A very little figuring will show that in many cases the increased earnings from the water power will fully justify the interest, maintenance and operation of an auxiliary steam plant to fill up an occasional brief and excessive shortage.

In this connection I would say that it is proposed to carefully cross-section the various reservoir sites and compute their volume at every level by intervals of 1 ft. A gauge will then be prepared reading, not in lineal feet of depth, but in cubic feet of residual volume; in other words, a glance at the scale will show the amount of water remaining in the reservoir at any moment. It is believed this will materially facilitate the close handling of the storage and auxiliary steam plant.

TABLE ILLUSTRATING METHOD OF ESTIMATING HYDRAULIC POWERS.

'94.	Rain-fall in inches.	Percentage of run-off.	Run-off in inches.	Monthly use.	Gain or loss.	Draft on Reservoir.	Monthly use—net.	Gain or loss.	Draft on Reservoir.
Jan.	2.16	.678	1.46	1.46	.00	.00	1.46	.00	.00
Feb.	1.74	1.01	1.76	1.46	+ .30	==	1.46	+ .30	==
Mar.	1.77	.658	1.16	1.46	— .30	— .30	1.46	— .30	— .30
Apr.	1.83	.516	.94	1.46	— .52	— .82	1.46	— .52	— .82
May	4.00	.829	3.32	1.46	+ 1.86	==	1.46	+ 1.86	==
Jun.	3.13	.398	1.25	1.46	— 21	— .21	1.46	— .21	— .21
July	1.55	.094	.15	1.46	—1.31	—1.52	1.46	—1.31	—1.52
Aug.	.31	.142	.04	1.46	—1.42	—2.94	1.46	—1.42	—2.94
Sep.	4.63	.186	.86	1.46	— .60	—3.54	1.02	— .16	—3.10
Oct.	4.82	.154	.74	1.46	— .72	—4.26	1.02	— .28	—3.38
Nov.	3.14	.192	.60	1.46	— .86	—5.12	1.02	— .42	—3.80
Dec.	3.53	.213	.75	1.46	— .71	—5.83	1.02	— .27	—4.07
'95.									
Jan.	3.87	.179	.69	1.46	— .77	—6.60	1.02	— .33	—4.40
Feb.	1.05	.808	.85	1.46	— .61	—7.21	1.02	— .17	—4.57
Mar.	2.71	.979	2.65	1.46	+ 1.19	—6.02	1.46	+ 1.19	—3.38
Apr.	5.56	1.119	6.22	1.46	+ 4.76	—1.26	1.46	+ 4.76	==

First trial without steam.

Second trial with steam.

I now come to a method of calculation which is found to possess many advantages over the ordinary procedure. The usual method is to reduce inches of run-off to cubic feet per second of flow and this back to horse-power. The work is thus exceedingly laborious and the chance of error increased. Much the more direct way is to adhere to the unit with which the calculation starts, namely, inches of depth. That is to say, the data at hand at the outset is inches in depth of rainfall, reducible in depth to inches of run-off. Let us therefore once for all reduce the horse-power, storage, auxiliary steam power, etc., to equivalent inches of depth of run-off and the problem becomes materially lightened with a corresponding decrease of possible error in its solution.

Let us assume 10,000 h.-p. as a trial development with steam auxiliary. At this point another formula becomes convenient as follows:

To find the monthly use of water for a given horse-power (24-hour basis) on 80 per cent. efficiency of wheels in inches depth of equivalent run off. Obviously

$$\frac{cfs \times \text{seconds in 1 month}}{\text{cu. ft. per 1 in. } r.\ o. \text{ on 1 sq. mile} \times D.A.}$$

is the expression for the above. Substituting (2) for *cfs* and we have

Monthly use in inches depth

$$= 11 \times H.\text{-}P. \times 2{,}592{,}000 \div h' = 2{,}323{,}200 \times D.\ A.$$

$$= \frac{12.27 \times H.\text{-}P.}{D.\ A. \times h'} \qquad (6)$$

Substituting the values in this particular problem we have, use per month = 1.46 in.

A rough survey of the basin indicates that 4,000,000,000 cu. ft. of storage can with certainty be secured. Dividing this assumed storage by 2,323,200 x *D. A.*, we find this volume of storage to be equivalent to 4.64 in. of run-off.

We have now reduced all our quantities to terms of equivalent inches of run-off and are ready to proceed.

Referring to the large table, column 1 indicates the successive months beginning with the year 1894, which was the year of extreme drouth.

Column 2 is the monthly rainfall in inches taken from the college records.

Column 3 is the percentage of run-off for the corresponding months from the Croton records and referring to the year 1880, which was a year of extreme drouth in that basin.

Column 4 is the product of columns 2 and 3 and is the inches of available run-off by months. It is always plus.

Column 5 is the equivalent monthly inches of use by wheels developing 10,000 mechanical horse-power. This quantity is always minus.

Column 6 is the run-off minus the use, or the difference between columns 4 and 5. This will appear plus or minus as the run-off exceeds the use or vice versa.

Column 7 is the constant algebraic addition of the successive numbers in column 6. This quantity is always minus with reference to a full reservoir and therefore represents the depletion of the reservoir each month.

An examination of the year 1893 shows at a glance that owing to heavy rains in the fall months the reservoirs were full at the beginning of 1894. It is to be further noted that when the reservoir is full any additional run-off spills to waste, and this condition of things is indicated by the double lines in column 7.

Going through with the calculation it will be seen that at the end of October the reservoirs were depleted to an equivalent of 4.26 in. equivalent run-off. Since the capacity of the reservoir is only 4.64 in., it is evident that the reservoir is substantially exhausted by Nov. 1, of this particular year, and we can proceed no further on this line.

I digress here to say that this same method of computation would enable us to determine the storage required if same were not already assumed. Thus, for instance, continuing column 7 through April of the following year it is seen that the maximum depletion, otherwise, the storage, would equal 7.21 in. equivalent run-off, which can be readily reduced to cubic feet of volume. In this particular case it is known in advance that 4.64 in. equivalent run-off is the limit of possible available storage. It is evident therefore that an auxiliary steam plant will be necessary to supplement the water in exceedingly dry years. Assuming 3,000 h.-p. as the capacity of steam plant, this can also be reduced to 0.44 in. equivalent run-off. When the auxiliary steam power is in use the net monthly draft of water would then be 1.46 in. — 0.44 in. = 1.02 in. It is therefore necessary to begin the calculation over again to include the steam power.

Column 8 corresponds to column 5 and shows the monthly net use of water.

Column 9 is the monthly gain or loss, and column 10 the monthly depletion of the reservoir. For instance, at the end of August the depletion was such as to warrant the starting of the steam plant. It proved necessary to run this continuously until the end of February, after which time the spring floods refilled the reservoirs.

As a matter of fact this particular problem was worked out for a continuous period of 24 years and at no other time within that period was the reservoir capacity seriously threatened. And pluviological history, if recorded for a sufficiently extended period, may be assumed to repeat itself.

It will be seen that once we reduce everything to terms of equivalent inches of run-off the general conditions for a series of years can be approximated almost by inspection. Thus, for instance, it would hardly be necessary to make any calculations at all for the year 1897 to 1904 inclusive, with the possible exception of 1899, as all these were years of abundant rain-fall, so that simple inspection shows that the run-off for the great majority of months was largely in excess of the use. This method of computation also has the advantage of dealing in small numbers. It is believed that it affords a more direct, accurate and rapid means of computation than any other. It is quite possible that other engineers have long since hit upon precisely this method and to such I make apologies. To those however who are still following the old path I trust this outline will be suggestive and useful.

THE HIGH-SPEED TESTS on the Zossen experimental track near Berlin have furnished a large amount of valuable data concerning high-speed traction. The following deductions from the tests give some suggestions that have not before been made, and are interesting as showing those features of construction of rolling and line that seem best adapted for such roads to Mr. Charles A. Mudge, formerly chief engineer of the Allgemeine Elektricitäts Gesellschaft: 1. Keep the car body as near the rail as possible. 2. Arrange all heavy pieces of apparatus so that their centers of gravity lie in the center of the car, or symmetrically placed to it, and as near the earth as possible. 3. Make all apparatus above the car floor as light as practicable. 4. Make the overhead trolley contact above the car, in preference to the side. 5. Support the motors flexibly on the axles. 6. Give the front of the car a wedge-shape. 7. Support the car body on the truck frame at some distance from the center bolt, and allow it a flexibility at right angles to the track, independently of the truck. 8. Make the total wheel base of the truck of ample dimensions, not less than one-fifth of the length of the car. 9. Build the road as straight as possible, and where more than one track is used, space them farther apart than is customary. 10. On curves make the approaches of the elevated side of the track longer.

The Sill Hydraulic Power Plant near Innsbruck.

By Franz Koester.

One of the recent additions to the long list of hydroelectric power plants in the Tyrol, is that built by the town of Innsbruck. It is interesting both on account of its mechanical and electrical features, the water power having a head of more than 600 ft. and generating current at 10,000 volts. The power is obtained from the River Sill, from which the plant derives its name, "Sillwerke."

Power House and Overflow of Sill Hydraulic Development.

The Sill is dammed near the village of Matocei, about 12 miles above the plant, where two by-sluices are provided to regulate the head. After passing these the water to be used in the wheels passes a sand trap before entering the raceway, shown in the illustration, at the left of the river. The two sluice gates, as well as the head gate, are operated by hand windlasses on a bridge spanning the river. A gate similarly operated is also provided at the sand trap. The entire head race, 11.6 miles long, is constructed of concrete and leads to a collecting basin, from where the penstock descends to the power-house. Before entering the collecting basin the water passes a second additional sand trap and also through fine screens in the penstock, which are operated from the building over the basin. At the side of the basin is an overflow leading down the mountain slope parallel to the penstocks to the side of the tailrace of the power plant. The mountain being very steep, this overflow takes the shape of cascades. The water level in the headrace is 2,889 ft. above the sea and the tailrace is 2,276 ft., making the gross head 613 ft. These is a water supply available of 247 cu. ft. per second. The power-house provides accommodation for six wheels, which are fed by two 48-in. penstocks; if only one had been installed the required diameter would have been 6.9 ft. The former arrangement is preferable, as each penstock supplies three wheels. When one unit is in operation the average velocity in the penstock is 3.4 ft. per second, with two 6.8 ft., and with three units 10.2 ft. per second, the respective water consumptions being 45.3, 90.6 and 135.9 cu. ft. per second.

The penstocks, one of which is already erected, lead down the mountain slope at an angle of about 33 deg., most of which is on the surface, about 300 ft., however, being in a trench. The total length of the penstock is about 1,900 ft. The penstocks are constructed in 9.6-ft. sections, made of rolled steel plates varying in thickness from 0.315 to 0.826 in., the latter, of course, being on the lower side where the pressure is greatest. The longitudinal penstock joints have from one to three rows of rivets, while the transverse joints have from one to two rows, according to whether the joint occurs at the upper or lower end. Angle iron flanges are riveted to the penstock and have their adjoining faces turned out, forming a trapezoidal opening, which is filled with a hard rubber gasket, so that pressure from within tends to tighten the joint. The flanges are bolted together. The whole penstock rests on concrete piers. About 80 ft. from the power-house, where an elbow occurs, the penstock is heavily reinforced and solidly anchored in a substantial concrete mass, which supports the penstock up about its center, where an expansion joint is located. At the center is also placed another solid concrete anchorage supporting the remainder of the penstock up to the collection basin, where a second expansion joint is provided. These expansion joints are of the slip type, packed with hemp. At the base of the penstock, where it joins the distribution pipe, there is a butterfly valve 4 ft. 7 in. in diameter, against which there is a pressure of 250 tons. This butterfly is operated by means of a worm and wheel direct from the power-house itself, and as it is also provided with a by-pass, its operation is greatly facilitated. The distribution pipe, with three outlets, is constructed like the lower end of the penstock. At the farthest end of the distribution pipe is a 10-in. emergency gate-valve for draining the penstock.

Dam and Head Race of Sill Hydraulic Power Works.

The power-house is 147 ft. long and 57 ft. wide, and has an extension centered on the side farthest from the penstock, used for a switchboard and measuring room. This extension is separated from the machinery room only by the switchboard itself. At the end of the building is a two-story superintendent's house, containing also the offices and repair shops. The building itself is constructed of concrete and stone, the wooden roof being supported on steel trusses. A plate-girder overhead traveling crane runs the entire length of the station. As previously stated, there is room for six units in the power-house, only two of which are now in operation.

The water-wheels, of 80 per cent. efficiency, when making 350 r.p.m. and using 45.3 cu. ft. per second, develop an effective output of 2,500 h.-p. These wheels, as well as the entire mechanical equipment of the power-house, penstock, etc., are manufactured by the Prager Maschinenbau-Aktiengesellschaft, successors to Ruston & Co., in Prague.

The wheels are of the horizontal Pelton bucket type, two wheels being mounted on one shaft between two bearings. On account of the frequent presence of sand in the water and the high pressure the regulating device is made very rigid and of a very hard bronze. For regulating the flow of water each wheel is provided with a servo-motor operated in conjunction with an oil cataract by a flyball governor driven by a worm and wheel. The shafts of the wheels are connected to the shafts of the generators by means of flexible couplings.

The generators are two-phase, 42-cycle, 2,000-kw., 10,000 volts, running at a speed of 350 r.p.m. The conductors run from the generators under the floor to the buses on the main switchboard, thence to a distribution board in the cable tower, from which latter they run out to a main steel distributing pole and thence out to the line supported on porcelain insulators on wooden poles protected by lightning rods. This power is distributed over the city of Innsbruck and the vicinity and used through stepdown transformers for both light and power.

One of the most interesting railroads of the Stubai Valley is also operated with this power. This is the road connecting the towns of Vulpmes, a famous and interesting tourist resort, and Innsbruck, the capital of Tyrol, a distance of about 11½ miles, the smallest curve of this road being on a radius of 130 ft. and the steepest grade is 4.60 per cent.

Power from a single phase is fed through copper mains of 25 sq. m.m. cross-section to three substations, where it is supplied to the trolley at a potential of 2,500 volts by means of two 75-kw. oil-cooled step-down transformers. This trolley wire, 53 sq. m.m. cross-section, is attached at intervals of 3 ft. by means of short wires to a steel wire supported on poles in spans of 160 ft. In the case of a single track one pole only with a projecting arm is used, but with double track poles are placed on each side connected with a cross-bar supporting the trolley wire system. At viaducts the overhead system is supported on a steel construction built across the tracks. The wire is carried 18 ft. above the track level, except in a tunnel, where this is reduced to 12 ft., necessitating a nearly horizontal running of the trolley arm, which is of the bow-sliding type.

The rolling stock consists of motor cars, trailers, and a few freight cars of small capacity. The motor cars are supported on two 2-axle trucks, 13 ft. between centers, and are equipped with four 40-h.-p. Winter-Eichberg motors, connected two in parallel and operated by special controllers. The voltage, of 2,500, is fed through step-down transformers with taps on the secondary, so that potentials of either 440 or 525 volts may be obtained.

The entire railroad as well as the electric equipments of the power-house and distribution system are installed by the Allgemeine and Union Electric Companies, of Vienna.

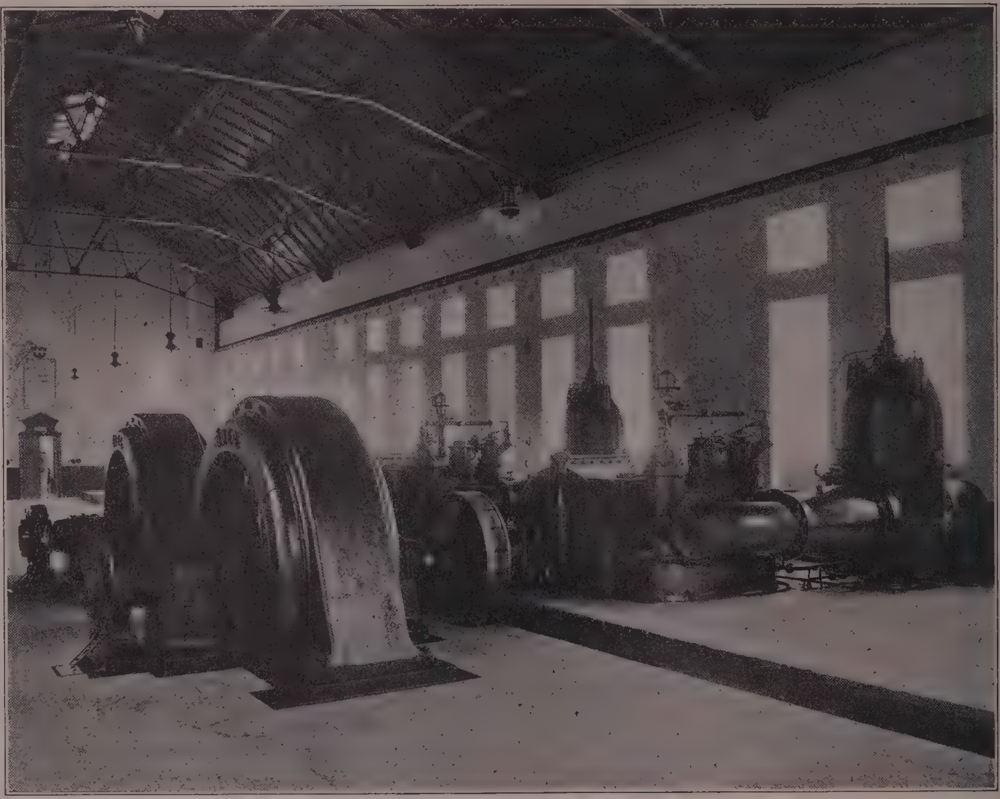
THE POLLUTION OF A STREAM by the refuse of a strawboard factory was recently before the Indiana Supreme Court in West Muncie Strawboard Co. v. Slack, 72 N. E. Rep., 879. The court rules that any one who creates a public nuisance is responsible to individuals specially damaged, not only for the loss he actually has occasioned them but also for the damages caused by similar acts of third parties which independently concur in causing the injury complained of. Under the Indiana statute providing that whoever unlawfully diverts any stream of water from its natural course or state to the injury of others shall be fined, etc., persons who maintain paper factories on the banks of a creek and discharge chemicals into it, destroying the fish in it, polluting it and the connecting streams, and rendering their water unfit for stock, are to be considered guilty of maintaining a public nuisance. The fact that a water course is already contaminated does not entitle other persons to aid in its contamination, or preclude persons injured thereby from recovering of them damages for the injury.

The Organization and Administration of National Engineering Societies.

Presidential address before the American Institute of Electrical Engineers, by John W. Lieb, Jr.

The most important factors in promoting the advance of the engineering profession and in disseminating and rendering available to the world the valuable experience and data accumulated by engineers in the practice of their profession, are the professional associations of national engineering societies. The importance of the interchange of data and results of observation and experience was recognized by engineers long before the practice of engineering had been exalted to the dignity of a profession.

While military engineering was recognized from the earliest times and great military engineers such as Vauban, and bridge and highway engineers such as Perronet had achieved eminence, it was manifestly impracticable for military officers to organize for the purpose of interchange of information, on the very secrecy of which the military establishments of nations were dependent for their offense and defensive efficiency. The first important step in the association of engineers into a professional body was taken when in 1828 Thomas Telford in the name of 156 of his colleagues—some of whom had already formed a society as early as 1818—applied for Royal Charter for the Institution of Civil Engineers (of Great Britain). The original charter recites that the body is formed "for the general advancement of mechanical science, and more particularly for promoting the acquisition of that species of knowledge which constitutes the profession of a civil engineer, being the art of directing the great sources of power in nature for the use and convenience of man, as the means of production and of traffic in states both for external and internal trade, as applied in the construction of roads, bridges, aqueducts, canals, river navigation, and docks, for internal intercourse and exchange, and in the construction of ports, harbors, walls, breakwaters and lighthouses, and in the art of navigation by artificial power for the purposes of commerce, and in the construction and adaptation of machinery, and in the drainage of cities and towns."



Interior of Sill Power Station.

It will be seen that this famous definition of the field covered by the profession of the civil engineer, as formulated by Tredgold, covers broadly all of the branches of modern engineering science, excepting military engineering, and includes within its scope directly or by implication mechanical, mining, electrical, and sanitary engineering and naval architecture. It was not long before important discoveries in the realm of physical science and epoch-making inventions and improvements in the mechanical arts opened new fields of industrial activity and we find this broadening of the field covered by the engineer reflected in a differentiation of the profession, in Great Britain resulting in the organization in 1847 of the Institution of Mechanical Engineers, in 1869 of the Iron and Steel Institute, and in 1871 of the Society of Telegraph Engineers and Electricians, which became in 1889 the Institution of Electrical Engineers.

Coming now to our own country, the American Society of Civil Engineers was organized in 1852, the American Institute of Mining Engineers in 1871, the American Society of Mechanical Engineers in 1880, and the American Institute of Electrical Engineers in 1884. While these are the distinctively national engineering societies, there are other technical associations like the Society of Naval Architects & Marine Engineers, the American Society of Heating & Ventilating Engineers, the American Street Railway Association, etc., which although of national importance, do not come within the scope of our subject.

There are still many other professional bodies in the United States identified with the engineering profession, some of a national character, which in addition to professional activities are also associated for commercial relations and whose memberships consist largely of business corporations, such as the National Electric Light Association and the Association of Edison Illuminating Companies, and still others largely local in character, such as the Pacific Coast Transmission Association, the Engineers' Society of Western Pennsylvania, and the league known as the Association of Engineering Societies, representing a total membership of 1766 in eleven local engineers' clubs or societies.

In this review we shall confine ourselves to the four national engineering societies first referred to, with some reference to the corresponding bodies in Great Britain and on the Continent.

The membership of these bodies divided into the several classes according to their last official reports, is given in the following table; as a matter of general interest there is also added a tabulation of the more important European engineering societies.

National Engineering Societies (U. S.)

Name and Date of Organization.	Date of Report.	Hon. Members.	Full Members.	Asso. Members.	Associates.	Junior Members.	Total.
Am. Soc. Civil Engineers, 1852	Jan. 1, 1905	9	1795	903	127	367*a*	3203
Am. Ins. Mining Engineers, 1871	Jan. 1, 1905	7	3483	—	190	—	3680
Am. Soc. Mechanical Engineers, 1880	Jan. 1, 1905	19	1915	—	237	609	2780
Am. Ins. Electrical Engineers, 1884	Jan. 1, 1905	2	481	2851	—	—	3334

a Including 27 Fellows.

Foreign Engineering Societies.

Name and Date of Organization.	Date of Report.	Hon. Members.	Full Members.	Asso. Members.	Associates.	Total.
Institution of Civil Engineers, 1818	Jan. 1, 1905	19	2191	4116	271	6597*a*
Institution of Mechanical Engineers, 1847	Mar. 1, 1905	9	2351	1545	72	3977*b*
Iron and Steel Inst., 1869	Jan. 1, 1905	11	1898	—	—	1909
Institution of Electrical Engineers, 1889	Aug. 31, 1904	6	1101*d*	1435	1761	4303*c*
Verein Deutscher Ingenieure, 1891	Apr. 24, 1903	6	17,543	—	—	17,549
Societe des Ingenieurs Civil de France, 1848	1901	—	—	—	—	3691

(*a*) Not including 1144 students or graduates. (*b*) Not including 450 students or graduates. (*c*) Not including 1107 students or graduates. (*d*) Including 136 foreign members.

A study of the annual reports of these bodies from year to year and of their constitutions and by-laws is of considerable interest, showing their progressive expansion, growing influence, and higher professional standing from year to year, and the lines along which these developments take place. We will not undertake a retrospective analysis, however, but rather confine ourselves to a comparative study of the methods of organization and business administration of the four national engineering societies as revealed in their last annual reports. It should be stated at the outset that this study is not undertaken with a view to criticizing the methods followed or results accomplished by our sister societies, but for the purpose of profiting by their experience and if possible avoiding in our own rapidly growing body any abnormal development which may detract from its efficiency as a whole, or result in purely local development at the sacrifice of general usefulness and national standing.

Requirements for Admission.—One of the very first questions we encounter is that of the grades of membership, then the requirements of admission to them, and the method of election. These questions are of fundamental importance and they are worthy of the closest attention, as upon them more than upon any other feature of the organization will depend the professional standing of the society and its healthy growth in membership and influence. There is no honor within the gift of the society which requires the exercise of so much judgment, such fidelity to its interests, such conscientiousness, impartiality, and impersonality as membership on the board of examiners or committee on admissions, and it is deserving of the highest recognition.

The requirements for honorary membership demand no lengthy discussion, as the practice of all of the societies is essentially identical in this respect.

The requirements for full membership vary greatly in the four societies, as we shall see from abstracts from their constitutions.

Am. Soc. C. E.—"A member shall be a civil, military, mining, mechanical, electrical, or other professional engineer, an architect or a marine architect. He shall be at the time of admission to membership not less than thirty years of age, and shall have been in the active practice of his profession for ten years; he shall have had responsible charge of work for at least five years, and shall be qualified to design as well as to direct engineering works. Graduation from a school of engineering of recognized reputation shall be considered as equivalent to two years' active practice. The performance of the duties of a professor of engineering in a technical school of high grade shall be taken as an equivalent to an equal number of years of actual practice."

Am. Inst. Min. E.—"The following classes of persons shall be eligible for membership in the Institute, namely: As members, all professional mining engineers, geologists, metallurgists or chemists, and all persons practically engaged in mining, metallurgy or metallurgical engineering."

Am. Soc. M. E.—"A member shall be thirty years of age or over. He must have been so connected with engineering as to be competent, as a designer or as a constructor, to take responsible charge of work in his branch of engineering, or he must have served as a teacher of engineering for more than five years."

Am. Inst. E. E.—"A member shall have been an associate, and at the time of his transfer to membership he shall be not less than twenty-seven years of age, and shall be: *a*, a professional electrical engineer; or *b*, a professor of electrical engineering; or *c*, a person who has done important original work, of recognized value to electrical science. To be eligible to membership, as a professional electrical engineer, the applicant shall have been in the active practice of his profession for at least five years; he shall have had responsible charge of work for at least two years, and shall be qualified to design as well as direct electrical engineering works. Graduation from a school of engineering of recognized standing shall be considered the equivalent of one year's active practice. To be eligible to membership as professor of electrical engineering, the applicant shall have been in responsible charge of a course of electrical engineering at a college or technical school of recognized standing for a period of at least two years."

It will be seen that two of the societies fix an age limit of thirty years, one twenty-seven years and one fixes no limit; one requires professional practice of ten years, one five years, two no time specified; three require professional competency in designing as well as constructing or directing engineering works, one requires the applicant to be professionally or practically engaged in the branch.

In the case of the Mechanical Engineers and the Civil Engineers the election is by ballot of the membership at large after approval by the executive board or council; in the case of the Mining Engineers and Electrical Engineers, election is by direct vote of the board of directors, in the latter after submitting the names to the membership at large, in the former without submission. In the Mining Engineers, Mechanical Engineers and Electrical Engineers the application is first passed upon by a board of examiners and then by the executive board or council; in the case of the Civil Engineers by the board of directors directly without action by an examining board. The Electrical Engineers' constitution requires that all members be first elected as associates and then transferred by the board.

It will be seen from the above how different the requirements are for full membership in the several societies, and how varied the procedure for election. It would appear at first thought that the more explicit the constitution in its exact definition of the conditions for membership the easier it would be for the membership committee to act, but this is by no means always the case, as it often prevents the taking of a broad view of the candidate's eligibility and is apt to exclude desirable material on very technical grounds, although on the other hand it is a protection against loose interpretation of the requirements by careless examiners. There would seem to be a better division of responsibility and more direct control of the class of men admitted to membership by giving wide publicity to their candidacy and election by ballot by the membership at large, after the candidates have passed the scrutiny of the board of an examining committee. A young society covering a branch of engineering that has but recently become specialized cannot in the beginning impose rigorous requirements as to age limits or time of professional service and the branch of engineering may be such as to make it difficult to impose severe technical requirements.

In the case of the Civil Engineers the accepted definition is sufficiently broad to cover applicants who are professionally engaged in any of the other branches of engineering; the Mechanical Engineers' definition is somewhat less comprehensive, the Mining Engineers' still less so, and the Electrical Engineers' really restrictive to professional electrical engineers. Under our Institute's constitution, however eminent a man may be as a civil, mechanical or mining engineer, he may not fulfill the qualifications of an electrical engineer. It will thus be seen that anything like standardization in the matter of requirements is wholly out of the question, although a greater uniformity in requirements and procedure for election would be advisable. It is very difficult for an applicant in every respect qualified for full membership in our Institute to understand why it should be necessary for him to pass through the preliminary, or as it were, probationary grade of associate, and then be transferred to full membership, but the constitution is clear. Applicants whose superior qualifications would entitle them to immediate election to full membership after their election to the preliminary grade of associate, which takes some time—several months at least—are apt to fail to make application for transfer, with the result that many remain in the associate class for several years before transfer and when they find the cause of the delay are apt to criticize the administration.

We now come to the consideration of the other grades of membership, associate membership, associates, juniors, etc. It would lead us too far afield to treat each grade in full and we shall confine ourselves to some general observations. It is necessary to provide one or more grades for young men just entering professional life and through which they can rise as they acquire experience to the dignity of full membership; but it is necessary to provide also for another class of men who, while they are not professional engineers, yet co-operate with them and conduct engineering works acting as the executive heads or business managers. To such men eminent in their particular branch of activity it is humiliating to be placed permanently in an inferior grade of membership with the beginners in professional service and the situation can be satisfactorily met by the establishment of the grade of associate;

junior and associate membership, thus to represent successive steps in the advancement to full membership, the associates forming a class by themselves.

Dues.—We now come to the question of the dues, and at the same time we may with advantage consider the general question of the income and expenditures or the cost of conducting the business of the societies.

The expense of membership in the several societies is given in the accompanying table:

Charges Against Members of Four Societies.

	Entrance Fees.			Annual Dues.			Foreign.	
	Juniors.	Assoc. Mem.	Members.	Juniors.	Assoc. Mem.	Mem. bers.	Associates.	Members.
Amer. Society Civil Engineers	$10	$25	$30	$15	$15	$25	—	—
Amer. Institute Mining Engineers	—	10	10	—	10	10	—	—
Amer. Society Mechanical Engineers	15	25	25	10	15	15	—	—
Amer. Institute Electrical Engineers	10	5	15	—	10	15	$5	$10

The Am. Soc. C. E. members in all classes living within 50 miles of New York pay higher annual dues. There is also an associate grade with $20 entrance and $10 annual fees.

In view of the new relations entered into between the three national engineering societies which are to occupy jointly the Union Engineering Building, and as the societies have now roughly about the same membership, it would appear to be desirable to have membership dues as nearly on a uniform basis as practicable.

It would appear that the entrance fees of our Institute might be revised without disadvantage, increasing the entrance fees for associate to at least $10 and a payment of an additional $15 on transfer, a total of $25 for full membership. An increase in annual dues also is not at all improbable in the near future, and they might with advantage be increased to $15 for resident associates (within 50 miles of New York) and to $25 for resident members; this increase for resident membership would seem to be warranted by the greater advantages enjoyed by the membership residing in or near New York, more especially after the occupancy of the Union Engineering Building.

Society Finances.—Let us now consider the annual receipts and disbursements per paying member per year in the four societies. These figures are presented purely as a matter of general interest and not at all of invidious comparison; the table of receipts and disbursements per member is subdivided under appropriate heads as accurately as they can be compiled.

Receipts and Disbursements per Year per Member.

Receipts.	Civil.	Mining.	Mechanical.	Electrical.
Entrance fees	$2.59	$0.28	$2.45	$0.83
Dues	16.99	10.64	14.04	9.30
Transactions, sales and adv.	1.86	2.09	1.64	1.70
Badges and certificates	.65	—	—	.28
Interest	.36	.34	—	.21
	$22.45	$13.35	$18.13	$12.32
Disbursements.				
Transactions	$4.63	$5.28	$7.50	$3.77
Salaries, etc.	6.13	4.22	3.99	2.20
Meeting expenses	.29	.30	.94	.82
Library, including rent and salaries	.30	.80	.39	.81
Rent	2.84	.74	2.79	.75
Stationery and miscellaneous printing	.62	.34	1.19	.70
Postage	1.10	1.02	.26	.66
General expenses	.34	.47	.11	.54
Badges and certificates	.50	—	.33	.25
Express	—	.83	—	.22
Totals	$16.75	$14.00	$17.50	$10.72
Credit balance per member.	$5.70	$0.65 (Deficit.)	$0.63	$1.60

It should be borne in mind that no deductions of value can be drawn from a mere comparison of these figures alone. Take the cost of the transactions, for instance. In order to make a comparison of the relative economy with which this item is handled in the several cases, it would be necessary to know in each instance the number of pages, number of cuts, number of advance copies distributed at meetings or in monthly advance publications in addition to the regular annual volumes. The figures therefore represent the amounts which are being spent on the several items, rather than a comparison of their economic handling; it would be fallacious to assume that the figures necessarily represent the comparative economy with which the societies conduct the items in the table.

Officers.—Our next concern is with the officers of the societies and the method of nomination and election. A truly national society should draw its membership from all parts of the country and should afford representation in its officers and on its administrative committees to the membership at large; in other words, should select its officers as far as possible with a view also to geographical distribution. It is admitted that this is difficult owing to the opportunities afforded to practicing engineers by large enterprises whose administration, technical as well as financial, is located in the important commercial centres, hence the important groups of members in the large cities. From these are drawn the majority of the officers, such selection being emphasized by the necessities of the central administration of the society. Such tendencies, however, are apt to operate to the disadvantage of available candidates for the important posts of honor within the gift of the societies who may happen to be stationed some distance away from headquarters, and to keep the institution on the plane of national standing it should also have a care to broad geographical distribution. This end can best be accomplished by providing for a nominating committee selected according to a geographical distribution into approximately equal groups of members, each geographical district consisting of say 300 or 400 members, and upon these, in consultation with a number of past officers, would rest the selection of the official nominees, with provision also for the filing of such nominations as may be made directly by the general membership. This procedure was introduced by the American Society of Civil Engineers several years ago. Such a plan would provide geographical representation and at the same time discourage unseemly electioneering and circularizing for the coveted posts of honor. It is thought by some that our own Institute could with advantage modify its own procedure in this direction.

We would add further that the election once accomplished the officers-elect could again with advantage to the interests of the Institute take office at once at the close of the annual meeting, or at latest as the last act of the annual convention. The supercession of the retiring president and officers and the installation of the new should be an official function before a general Institute meeting, a deficiency of our present method of procedure, which now allows four months to elapse after the election of the new officers before they actually take office, and within three months or at most four months after taking office the active canvass for their successors already begins. It will be admitted by all with experience in the administration of professional societies that it is most desirable to eliminate all tendencies to political agitation in connection with the election to the honors within the gift of the membership, concentrating all efforts on the advancement of the professional standing of the society and the interests of its members. It would also seem to be of advantage to have the fiscal year coincident with the calendar year; this would bring the annual meeting less close to the annual convention and spreading it over several days would secure a larger attendance of the out-of-town membership for the annual business meeting and the annual banquet or other functions could be held at this time. The annual meeting as held at present is not markedly distinguished from the other monthly meetings, and there is usually a month between it and the annual convention. With the growing importance of the financial interests confided to the care of the successive administrations the yearly business meeting should have larger attendance and participation from the membership at large than is the case at present.

The administration of the societies should be in the hands of their Board of Directors or Councils, and similarly the important standing committees in whose hands rest the conduct of the routine in the several branches of administration should be committees of the board or council. Such being the case it is desirable that their appointment should in the beginning rest with the board itself, one member of each standing committee retiring each year and the new president filling the vacancies, a much more satisfactory arrangement than the plan followed by our Institute at present under which the responsibility of the appointment of all the committees, standing as well as special or temporary, rests alone with the president. The suggested plan of appointment of the administration committees primarily by the board or council, the president filling the vacancies that occur each year, is not the one usually followed by our national societies, but even where all the appointments devolve on the president alone, membership on the standing committees is as a rule limited to members of the board. The advantage of selecting the standing committees from the members on the board is evident as the committees are then not apt to follow a policy at variance with the wishes of the executive body, disturbing harmonious relations and continually raising questions of jurisdiction.

It is also desirable to avoid constant changes in the personnel of such important committees as the finance, library and membership committees; provision should be made for standing committees of three or five with one member retiring each year, the new members to be appointed by the incoming president. Such a plan secures continuity of policy, gives the committees the benefit of accumulated experience and relieves the president of the responsibility of making such a large number of new appointments on entering his term of office. Such standing committees as finance, membership, library, publication and meetings, or the last two consolidated into one, are necessary for all societies, together with such other committees as the particular field covered by the work of the society may require. Outside of the standing committees required by the regular routine, it is desirable to avoid as far as practicable the appointment of special or temporary committees, and these when the special work assigned to them has been performed should be discharged. There is nothing more subversive of effective and energetic administration than board meetings at which an interminable series of committees make "no report" or the chronic "report of progress."

In case it is considered advisable to appoint a separate "committee on meetings" or "papers and meetings" and a "committee on publications" or "editing committee"—a division of work which becomes necessary when monthly meetings are held with reading of papers and discussions as well as one or more annual meetings—it becomes necessary to define their respective responsibilities very clearly, placing upon the committee on meetings or papers the responsibility of the acceptance of the paper or communication for presentation at the meeting and upon the publication or editing committee alone the responsibility for the publication of the paper or discussion, as a whole or in part, in the official transactions of the society.

It might be observed here that great care should be exercised in the conduct of a society occupied with a specific branch of engineering, that as far as practicable all of its divisions receive due consideration. In an Institute of Electrical Engineering, telegraph and telephone, electric traction and electric lighting, central station and isolated plant, transmission and distribution, design and construction, theory and practice, in fact all branches of electrical engineering, should receive consideration and in the solicitation of papers for the series of meetings held during the year a wide range of subjects should be so covered as to interest and attract the largest circle of members.

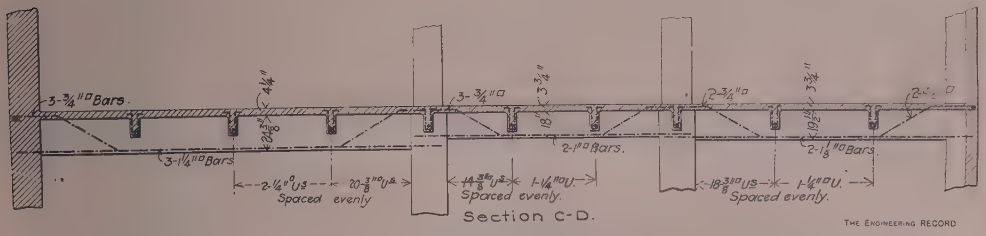
Local Branches.—We have already referred to the importance of conducting a national society on broad lines so that the members at large should have a share in the benefits as well as the obligations of membership whether they be located near the headquarters of the society or at a distance. It is manifest that when the monthly meetings, as well as the more important annual functions, are held at the headquarters of the society, the members at a distance feel that they are at a disadvantage, and there is a tendency to form local clubs or organizations and secede from the parent society or at least lose interest in it. Our Institute has met this situation courageously and through the initiative of Past President Scott a series of local organizations was established and they have been added to under succeeding administrations; these organizations have done much to keep up the interest at distant points and they have undoubtedly induced desirable accessions to our membership and have been an important stimulant of professional activity.

Our sister societies are facing the same problem and are watching the result of our undertaking—it can no longer be called an experiment—with great interest. But this scheme of local organizations while undoubtedly successful, is developing new problems and new conditions and requires the constant care and supervision of the central administration.

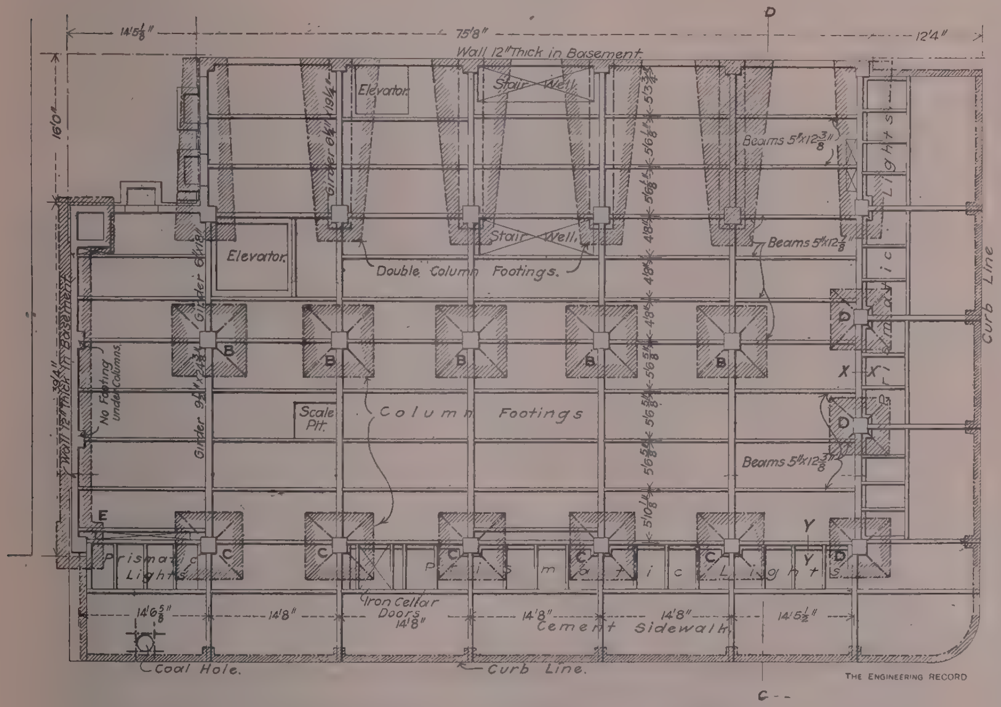
As the close of another administrative year draws near I have felt it incumbent upon myself, and the fulfilment of a duty, to direct your attention to some of the questions which are before us and to give expression to a few thoughts that have occurred to me as a result of some years' experience in connection with the administrative work of our own society, and a study of the methods followed by our sister engineering societies.

The comparisons which have been presented and the suggestions offered are not made in a spirit of criticism, nor am I unmindful of the splendid work accomplished by the framers of our present constitution, to whom the highest credit is due for an altogether excellent compilation, but our Institue is growing rapidly and with its expansion new problems are arising, its field of activity is constantly broadening, and it should be expected, therefore, that modifications in its organic law may from time to time become necessary.

It is in meeting and solving new problems of society administration, as I have referred to, that the youth and enthusiasm of our members is of the utmost advantage. We are less handicapped by precedent and tradition than some of our older sister societies, and we may therefore expect for the Institute of Electrical Engineers a glorious future full of activity, initiative and prosperity, and successful in the attainment of the highest professional standing, dignity and usefulness.



Floor System in Hauck Building.



Plan of First Floor and Basement, Hauck Building.

The Hauck Building of Reinforced Concrete, Cincinnati.

By W. P. Anderson.

The leading part taken by Cincinnati in the development of concrete-steel construction and the impetus which this construction has received since the Baltimore fire are forcibly demonstrated by the many and large concrete structures now being erected there. Among these is the seven-story Brookfield Rye Building, at Seventh and Main Sts., designed to be used as a whiskey warehouse and rectifying establishment by the Rare Old Perfect Brookfield Rye Men.

The foundations rest on excellent gravel, the bearing power of which was taken at 4 tons per square foot. The isolated column footings present nothing of special interest, but along the north party wall it became necessary to use cantilever or inverted beam footings in order not to trespass on the neighboring property. The details of these footings, of which there were six, are shown in the accompanying illustrations. The west wall is carried on its own footing, while the north wall is hung on the wall columns, the wall footings being entirely omitted.

As all floors are alike, with the exception of some unimportant details, the illustrations will serve to make clear the arrangement of the beams and girders. A live load of 225 lb. per square foot is provided for in the design of the slabs and beams, 200 lb. of which is assumed to come on the girders and 180 lb. on the columns. The beams and girders were figured as partially fixed, bars being placed in the top over the supports to take care of the tension resulting from the negative bending moments at these points. U bars 1/4 and 3/8 in. square in section were used in the beams and girders to resist the shearing stresses and were provided at their upper ends with 6-in. wings bent at right angles to tie the slabs securely to the ribs.

All steel, except that in columns and some in the wall, which was round, consists of Ransome twisted bars, stressed in tension to 20,000 lb. per square inch in the floor slabs and 21,000 lb. in the beams and girders. The extreme fiber stress in compression on the concrete was taken at 750 lb. per square inch.

The columns were designed with a unit compression stress of 10,000 lb. on the steel, which consisted of round bars placed near the outer surface of the concrete in the customary manner, and 750 lb. on the concrete. The vertical bars are securely bonded with horizontal ties of 1/4-in. plain square bars at intervals not exceeding the side of the column and even then never more than 12 in.

All walls are likewise built of armored concrete with a facing of brick and stone trimming, carried by small concrete ledges or brackets at every floor level. The view of the partly completed building plainly shows these ledges, which are omitted under some windows because of the carved stone panels with which they interfere. Galvanized wires were placed in the concrete at every sixth course vertically and every 16 in. horizontally, by means of which the facing was bonded to the wall. Wherever wooden frames were used they were first given a coat of paint, and then placed in the forms so as to be concreted in place with the walls. The metal frames in the area way were too thin to prevent distortions from tamping the concrete and were put in place afterward. On the inside there is no finish of any kind except in the office on the first floor, which is plastered. All floors have a wearing surface on top of the concrete 3/4 in. thick, put on before the structural concrete had set.

The roof and sidewalk, including the prismatic lights, are likewise of concrete-steel construction similar in design to that already described. The roof is to have a coat of asphalt.

One set of stairways is of reinforced concrete, while the other is built of channel iron strings and wooden treads. Both stair and elevator enclosures and all partitions are constructed of trussed metal lath, coated on both sides with Portland cement mortar. All interior doors are tin lined. The window frames in the areaway are made of metal and together with the elevator penthouses are covered with wire-glass; in short, every precaution was taken to insure a fireproof building.

Two rectangular concrete tanks will be constructed, one on the fifth floor to hold 2,500 gal. of distilled water, and the other, a twin tank, one compartment to hold 2,500 gal. of spirits and the other 2,500 gal, distilled water. It is believed that this is the first departure of this kind in the whiskey process (these tanks usually being copper), although wine vats have been made of armored concrete in France.

The mixing plant was located in the cellar and the large elevator shaft was used for hoisting up the concrete. In fact, the whole arrangement was like that used at the Ingalls Building (see The Engineering Record of July 18, 1903), except that the hoisting engine was located in the street instead of in the basement. The concrete, which was mixed fairly wet, was mixed in the proportions of 1 part Lehigh cement, 2 parts sand and 4 parts crushed gravel, the latter including the run of the crusher, no stone exceeding 1 in. in diameter. The columns and walls were filled in a day, a story height being concreted from above. On the following day all concrete for the slabs, beams and girders was placed, working from 7 A. M. to 8 P. M. and covering about 4,700 sq. ft., the finish being placed the same day.

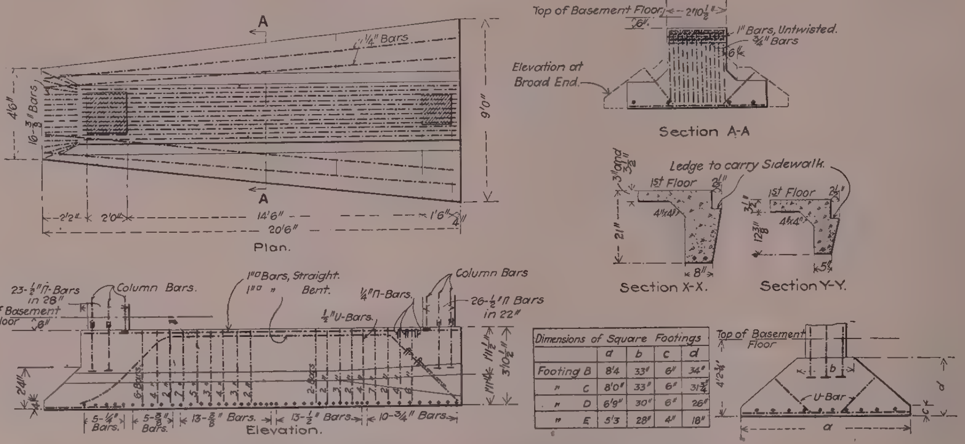
Complete sets of forms were made for three floors and the similarity between the different floors permitted the repeated use of these forms. All lumber was 1¾ in. thick and the general style of the molds was like those used at the Ingalls Building. The specifications did not permit any irregularity in the concrete exceeding ⅛ in., as the inside surface was not to receive a finish of any kind.

It seldom happens that a building can be occupied, even in part, when the structure is but half completed. Such, however, was the case with the Hauck, or Brookfield Rye Building, as it is sometimes called, the owners taking possession of their office at the opening of the national convention of the Order of Elks. They have occupied the office continuously since without any inconvenience to themselves or to the contractors.

A loading test was made on a girder on the first floor, using a load composed of bricks piled on separate piers to prevent arching.

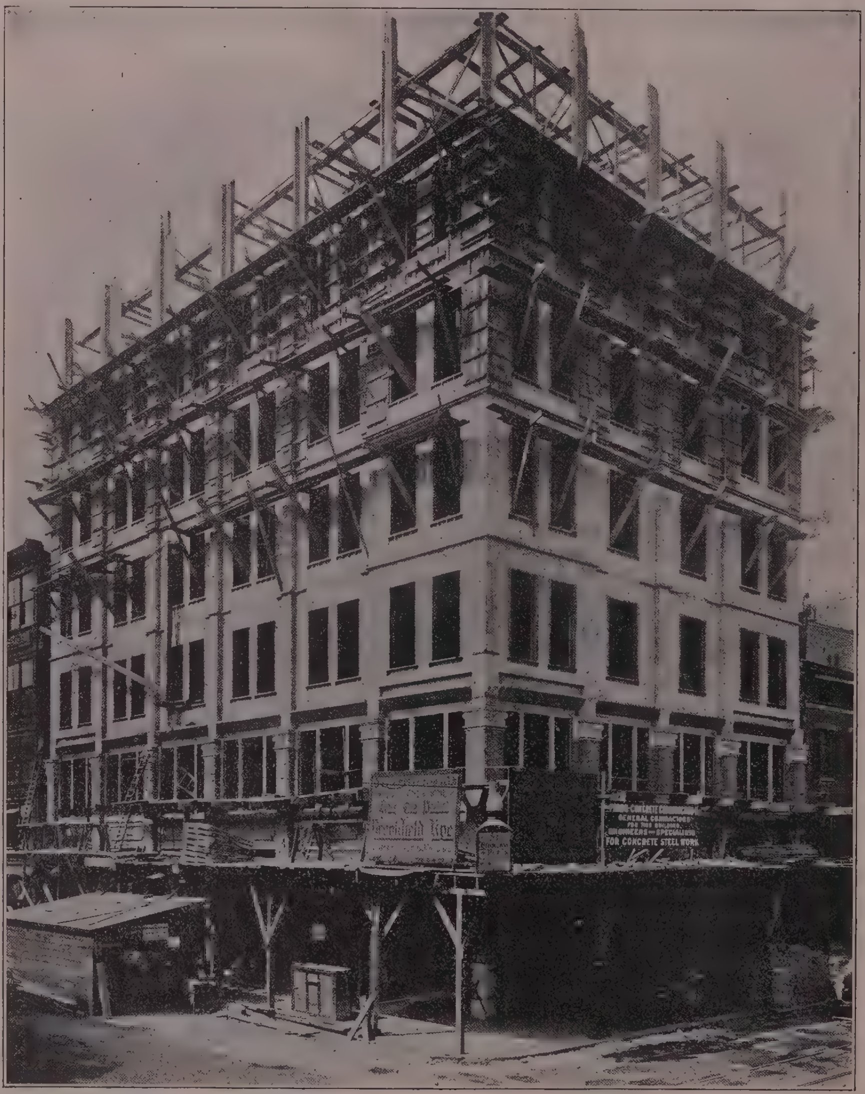
A uniformly distributed load of 124,000 lb. (about twice the live load) produces a deflection of only 7/64 in.

Mr. J. J. Rueckert is the architect of the building, and the Ferro Concrete Construction Co. is the general contractor for all work in connection with it.



Dimensions of Square Footings	a	b	c	d
Footing B	8'4	33"	6"	34"
" C	8'0"	33"	6"	31¾"
" D	6'9"	30"	6"	26"
" E	5'3	28"	4"	18"

Footing and Sidewalk Ledge Details, Hauck Building.



View of the Hauck Building, Cincinnati, during Construction.

Long Steam Pipe Lines are a noticeable feature of the anthracite coal district. It is not unusual to see several pipe lines up to 1,000 ft. or more in length, radiating from a central boiler plant to neighboring mine workings, the economy of this method of distribution being due to the cheapness of the fuel in comparison to the cost of boiler-room labor. One steam line over a mile in length is said to be in operation in the vicinity of Scranton, while a large number from 2,000 to 4,000 ft. long are operated. In most cases these lines are carefully protected by non-conducting pipe coverings, asbestos and magnesia being used mostly.

Reconstruction of the Ventilation System of the House of Commons, London.

The heating and ventilating system of the House of Commons, at London, Eng., which has been criticised for many years, has at last been reconstructed. The original system of ventilation for the debating chamber, historic and interesting for the use of extraction or exhaust furnaces for the removal of foul air, has been replaced by a fan and air-scrubber system of air supply. With the growth of the work in the House of Commons and the increased requirements upon the original ventilating system, it had become entirely inadequate for the service, and, on the recommendation of a special committee appointed in 1902, it was decided to retain the general system then in vogue, consisting of a combination of plenum and exhaust systems, but to substitute a large electric fan for the original exhaust furnaces and a similar fan for the fresh air intake, and to adopt a new system of water screens for the air cleansing in place of the original simple water sprays. The manner in which the work has been carried out is described substantially as follows in "The Engineer" of London:

The old extraction furnaces have been removed and two large electrically driven blowers, each of a capacity of delivering 50,000 cu. ft. of air per minute, installed, one in the passage between the fresh-air inlets on the Members' Terrace and the plenum chamber beneath the floor of the House, and the other in the exhaust gathering chamber above, to discharge into the shaft over the Commons Lobby. The fans are capable of delivering their maximum output against a pressure equivalent to 1 inch of water, if desired, although they are provided with means of regulation for a wide variation of delivery. The fans, which were built by Matthews & Yates, of Swinton, Manchester, are 8 ft. in diameter, with blades 5 ft. 6 in. wide, and are driven through belting by 20-h.-p. Siemens variable-speed electric motors which have speed variations of from 450 to 900 r.p.m. by field control.

Before reaching the intake fan the fresh air from the terrace passes through a large screen of copper wire gauze with a mesh of 400 to the square inch, down the surface of which cool water is allowed to fall, giving the wire the appearance of a sheet of glass. The incoming air has to pass through this film of water, and in doing so is deprived of particles of dust and soot, and at the same time is humidified. This screen was specially designed by Mr. E. G. Rivers, and is of a type not hitherto used. The water is thrown on to the screen by the original impingement jets which were designed many years ago by Sir Goldsworthy Gurney. It is not used a second time, but to prevent waste is collected and by means of a float and electrically driven pump automatically elevated into a tank for boiler-feeding purposes. In cold weather steam radiators, fitted outside the water screens, impart to the atmosphere the necessary degree of warmth. It is thought that in foggy weather the air will be sufficiently purified by these arrangements, but the huge cotton wool filter below the equalizing chamber remains for the present. The intake fan is controlled from below the floor of the Debating Chamber by one of the ventilation attendants, and the adjustment is capable of such delicate manipulation that the speed of the fan can be varied as little as one revolution per minute without the attendant having cause to leave his post.

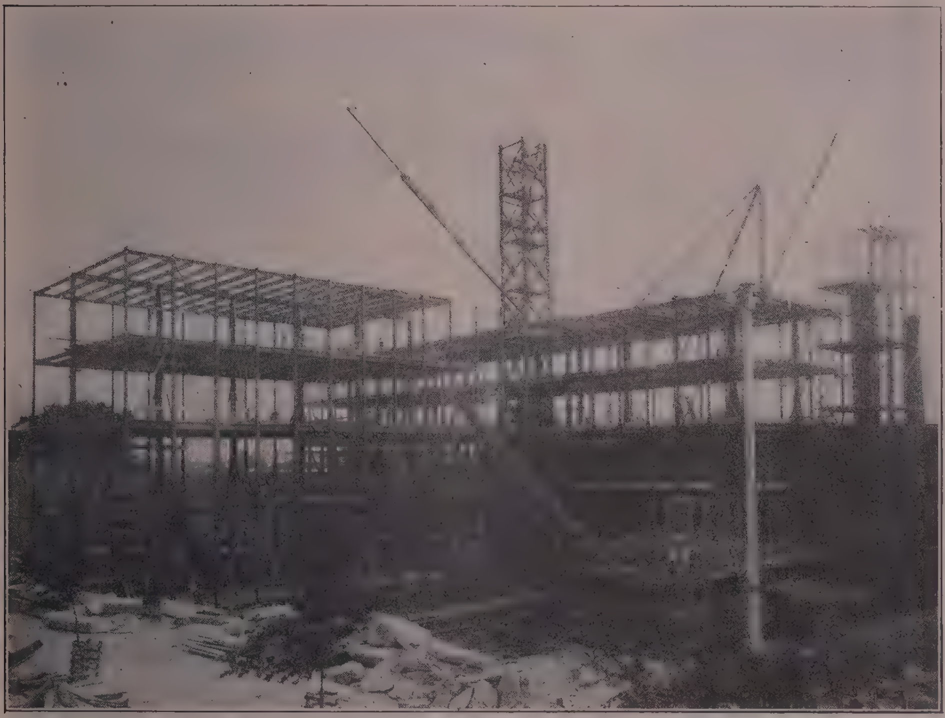
A test made on the evening of May 9, when about 600 persons were present, showed that, with the motor running at 600 r.p.m., 53,000 cu. ft. of air were driven into the chamber, with an expenditure of 8 kw. of current. The capacity of the Debating Chamber of the House of Commons is 165,000 cu. ft.; so that with the intake fan delivering 40,000 cu. ft. of air per minute, the atmosphere can be entirely changed about fifteen times per hour.

The air, as formerly, finds its way from the plenum space up to the Chamber through the floor grating, which is covered with string matting of coarse mesh. It has always been a matter of some difficulty to keep this floor covering thoroughly free from dirt, which cannot fail to be carried in on the boots of the occupants; now it is removed periodically for cleaning and is disinfected in a special chamber by formalin vapor before being replaced, while the cushions, benches, and woodwork generally are cleansed by means of a vacuum cleaner. After it has passed through the flooring of the chamber the air rises to the ceiling and is extracted by the second fan previously mentioned, which is of equal capacity to the intake fan.

As a result of the increase of the air supply it was also found necessary to install additional heating equipment, for which the Webster system of low-pressure vacuum-return steam heating was adopted. A number of radiators operated upon this system were located to provide the additional heating where required. The condition of the committee rooms, which had frequently been the subject of legitimate complaint, has also been thoroughly investigated, and improvements have been introduced. Electrically driven extraction fans are placed either at a high level in the windows, or in the ceilings, and amply large fresh air inlets, which can be easily cleaned, are provided at the floor level. In all cases it is now possible to give from six to eight complete changes of air per hour in these rooms.

An important feature of the new plan has been the appointment of a sanitary officer, under the Office of Works, to direct and superintend the ventilation of the House, and also the placing of the whole of the cleaning arrangements under one authority. Mr. A. P. Patey was appointed resident engineer in charge of the new work and subsequent operation, and by him the work of remodeling of the ventilation system was carried out, under the direction of Mr. E. G. Rivers, chief engineed of H. M. Office of Works.

The New Machine Shop of the Brown & Sharpe Mfg. Co.



Erection of the Brown & Sharpe Machine Shop.

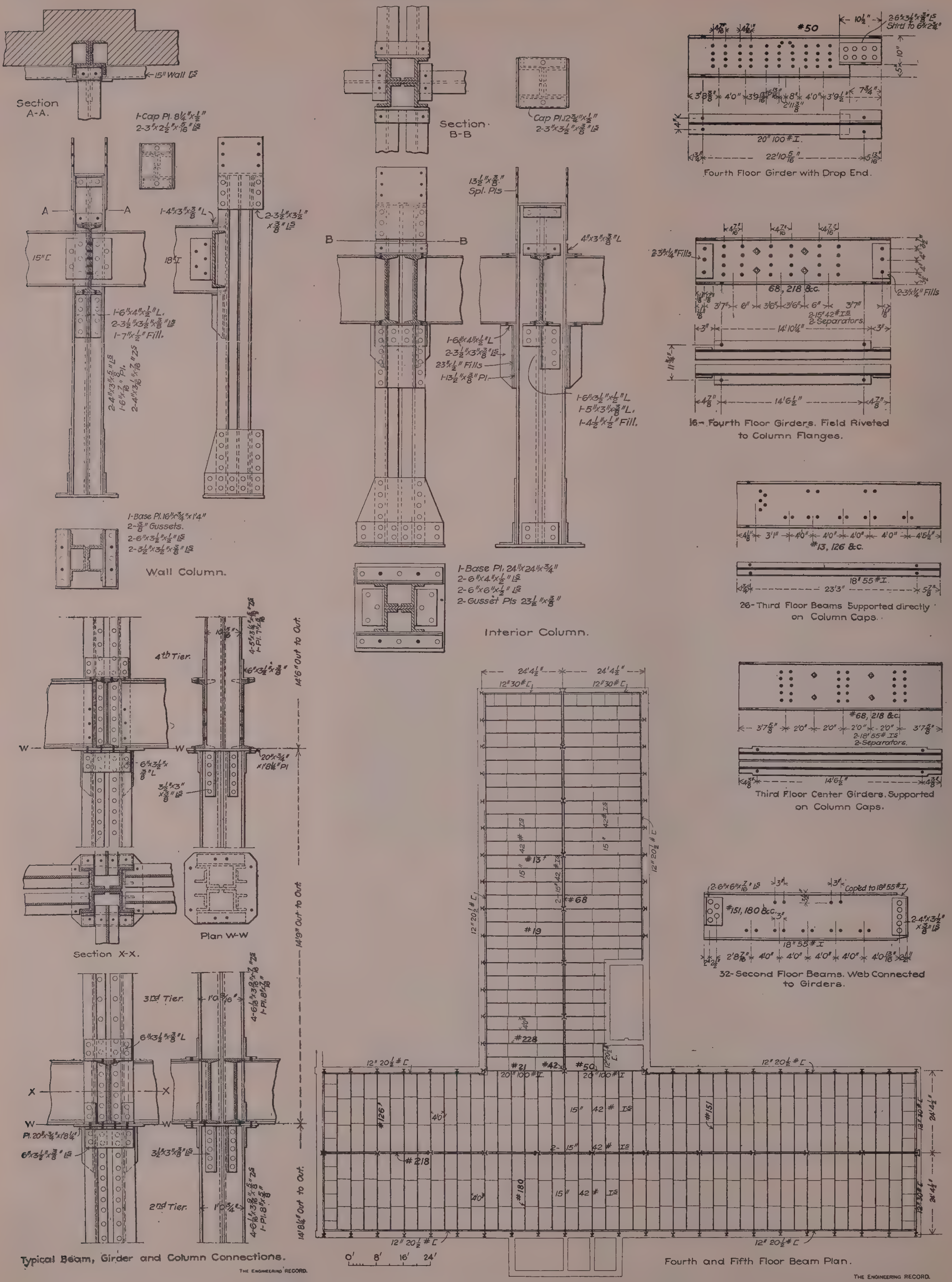
The No. 4 building of the Brown & Sharpe Manufacturing Co., Providence, R. I., is a five-story, steel frame structure with independent, self-supporting brick walls, which do not carry any of the floor loads. It consists of a 50 x 178-ft. main part and a 50 x 112-ft. wing at right angles to it at the center point, both of them having slightly pitched flat roofs about 72 ft. above the ground. The structural steel work is remarkable for its simplicity and regularity, and consists of steel columns, generally 8 ft. apart on centers in the planes of the outer walls and a single row of columns 16 ft. apart on the longitudinal axis of each part of the building, and longitudinal girders and transverse beams for the roof and upper floors.

There are in all 75 columns, all having rectangular base plates seated on the granite caps of concrete piers to which they are secured by four ¾-in. anchor bolts. Except for a few wall columns, where there is special construction, the columns are made in one-story lengths spliced 30 in. above the finished floor line. Two columns in the centers of the end walls have rectangular closed sections made with two 12-in. channels and two 20-in. cover plates. The upper end of each of these columns is covered by a horizontal cap plate on which the ends of two 20-in. I-beams are seated and secured by rivets through the top and bottom flanges. Horizontal angles are riveted to both webs and to the flanges on one side of the upper section of the column, and the splice is made between the sections by field rivets through these angles and the cap plate and through a vertical cover plate shop-riveted to the lower section of the column.

All other wall columns are made with one 6-in. web plate, two 4 x 3-in. Z-bars and two 4 x 3-in. angles, the heaviest sections having metal ⅝-in. thick. These columns are eccentrically loaded by a single connection for a single 18-in. floor-beam seated on a horizontal angle shelf, with the projecting flange reinforced by the milled ends of a pair of vertical distribution angles. To these I-beams 15-in. girder channels parallel to the walls are web-connected with their flanges turned outward and just clear of the brick work. Each channel has a field-riveted web-connection at the center point with the end of the intermediate 18-in. floor beam. The columns are spliced with horizontal diaphragm plates and with pairs of flange cover-plates riveted to the Z-bars and to short vertical connection angles forming flanges on the main angles.

The columns are set in chases in the brick walls opposite outside buttresses and are entirely enclosed by the brick work except the outer flanges of the Z-bars, which with the webs of the channel girders are within 7 in. of the column centers and are enclosed by the floor construction and the metallic lath and plaster. The interior columns are made with four Z-bars and a web plate, the heaviest cross-section being composed of 6⅞ x 3⅝ x ⅞-in. Z-bars and an 8 x ⅞-in. plate. They are symmetrically loaded by two pairs of I-beam girders perpendicular to the plane of their web, and two single I-beams in the plane of the web, all being supported on horizontal shelf angles with the horizontal flange supported by bearing on the milled upper ends of distribution angles having their outstanding flanges in the planes of the I-beam webs.

The columns in the uper tier have horizontal cap plates similar to the base plates of the first-tier columns, and the roof girders are seated on these caps and secured to them with one flange rivet at each end of each I-beam. Some of the fourth-tier columns have smaller Z-bars than those in the third tier and are concentric with



Section A-A.

Wall Column.

Section B-B

Interior Column.

Fourth Floor Girder with Drop End.

16- Fourth Floor Girders, Field Riveted to Column Flanges.

26- Third Floor Beams Supported directly on Column Caps.

Third Floor Center Girders, Supported on Column Caps.

32- Second Floor Beams, Web Connected to Girders.

Typical Beam, Girder and Column Connections.

THE ENGINEERING RECORD.

Fourth and Fifth Floor Beam Plan.

THE ENGINEERING RECORD.

FRAMING PLAN AND TYPICAL DETAILS OF THE NEW MACHINE SHOP OF THE BROWN & SHARPE MFG. CO.

them, their milled lower ends bearing on the thick cap plates of the third tier and loose filler plates being inserted between their flanges and the splice-plates which are shop-riveted to the tops of the third-tier columns. In the upper two tiers of interior columns the splices are made entirely with horizontal diaphragms and flange-angles and the double I-beam girders have their inner flanges cut to clear so that their webs are field-riveted across the flanges of the column Z-bars.

In the third tier the longitudinal double I-beam girders are seated with their lower flanges bearing on the cap-plates of the second-story columns between their Z-bar flanges. The heaviest I-beams are those marked 21 and 50 at the intersection of the two wings, which are 20 in. deep and weigh 100 lb. per lin. ft. In the second tier these are supported at both ends on their lower flanges, but in the third, fourth and fifth tiers one end is supported on the cap of column 42 at a level above that of the beam flange and the latter is cut to clear and pairs of bearing angles are riveted to the beam web and take a bearing on the cap-plate with their horizontal flanges.

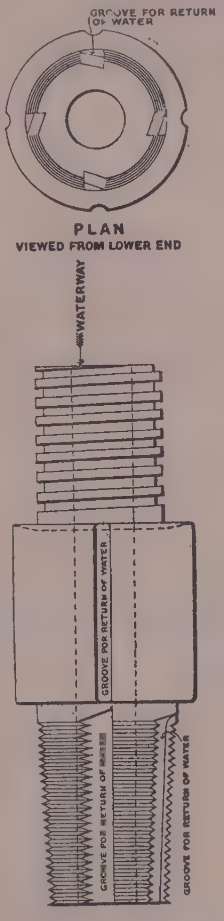
The arrangement of beams and girders is the same and the sizes and weights of beams are nearly the same for the roof and second and third floors, as is shown in the beam plan for the fourth and fifth floors, except that in the second floor beams 19 to 228 inclusive are omitted, leaving an opening through the floor at that point. The transverse beams are uniformly 18 in. deep and weigh 55 lb. per lin. ft. and the double longitudinal girders have the same dimensions for second and third floors.

The roof is made with 12-in. 31½-lb. transverse and double longitudinal I-beams and with 10-in. 15-lb. channel girders parallel to the walls. In all cases the transverse beams are 4 ft. apart on centers and their webs are connected by two lines of tie rods in each span. All connections are made with ¾-in. rivets, shop or field-driven, and no bolts are used in column splices of beam connections. The top flanges of the beams and girders are in the same horizontal plane and where both members are of the same depth both flanges of the beams are coped to clear those of the girders, allowing a clearance of about ⅛ in. and lengths are cut for a clearance of about 1/16-in. at each and between the web of the beam and that of the girder.

The simplicity and regularity of the design and the duplication of members reduced the number of shop drawings to a minimum, and enabled many of the pieces to be tabulated with slight variations noted. Each 24 x 30-in. sheet of column details gave two columns or groups of columns. Many of the columns are duplicates, as many as 46, 51 and 56 pieces being ordered from a single sketch for the wall columns. Beam plan diagrams were made for each floor and the columns, beams and girders were marked on them in regular succession from 1 to 75 and from 1 to 228, and the steel was marked with the same number and with the tier number so that its identification was very simple and positive. The tiers were shipped separately and stored in order so that the pieces were handled for erection without extra trouble. Order prints of all the beams and girders were made on 12 x 18-in. sheets, each containing from three to five sketches, and as many as 63 duplicates were ordered from some of the sketches. These sketches correspond to those of the typical beams and girders shown and were drawn to scale for depth and connections, but not for total lengths. Wherever it was practicable connections were made with angles punched to the Cambria standard, and there rivet spacing on the drawings was omitted. Standard cast-iron separators were shipped bolted between the I-beams of the double girders, and where the webs of the latter were riveted to the column flanges and required fillers these were shipped bolted to the girder webs.

A wooden tower about 10 ft. square and 140 ft. high was erected nearly in the center of the long wing of the building at the commencement of operations and was used for hoisting most of the steel and for setting and assembling it except at the extremities of the wings. It had four 10 x 10-in. vertical posts made in 30-ft. lengths with butt joints spliced with bolted scabs, and each face was divided into panels about 15 ft. high by horizontal struts. The panels were X-braced by 2 x 8-in. planks bolted on and the base of the tower had longitudinal and transverse sills extending beyond the corner posts and covered with a platform on which the hoisting engine was seated and which was additionally ballasted by pig iron to give it an increased moment of stability, the tower being unguyed.

A 70-ft. boom, made with two 12 x 12-in. timbers lapped 20 ft. and lashed together, was seated on a cross-sill at about the roof level and rigged with four-part wire-rope hoisting and topping lift-tackles, not visible in the picture, the latter being attached to the top of one of the vertical posts. Beams and columns not assembled by this boom were delivered by it to trucks and rollers and distributed over the successive upper tiers or floorbeams on runway planks to three movable stiff-leg derricks, which erected the ends of the wings. These had 50-ft. booms and at the completion of each tier were partly dismantled, lifted to the top of the steel work and reassembled by the tower derrick.


GROOVE FOR RETURN OF WATER
PLAN
VIEWED FROM LOWER END
WATERWAY
GROOVE FOR RETURN OF WATER
GROOVE FOR RETURN OF WATER
GROOVE FOR RETURN OF WATER
ELEVATION

Tap for Recovering Diamond Core.

Great care was taken to plumb all the interior columns and brace them accurately in position by four light batter-posts clamped to the top of each as soon as it was set. The next-to-the-last wall columns in the ends of the wings were plumbed and braced longitudinally by pairs of diagonal timbers and the whole framework was thus kept well lined up and the members fitted so accurately that the connections were made without difficulty. No other wind bracing was used, but all field connections were fully service-bolted when made and several riveting gangs followed as close as convenient. The erection of the framework was practically completed before work on the floors or walls was commenced.

Mr. W. T. Hatch was the chief engineer and architect for the owners and the details of the structural work were developed and the structural steel work fabricated and erected by the Cambria Steel Co., Johnstown, Pa., Mr. George E. Thackray, structural engineer.

Recovering a Diamond Core from a Deep Boring.

In the exploration of the Van Ryn Reef, about 33 miles from Johannesburg, the drilling was done with a Sullivan machine made for boring a depth of 4,000 ft. The rods were obtained from England in 10-ft. lengths and the core-barrel was in two 20-ft. lengths. After about a year's work the hole was sunk to a depth of 3,233 ft., where the bit became jammed and the rods were drawn up. When the last rod had been removed the core barrel was drawn up and found to contain no core and to be without the shell and diamond crown. The shell is a piece of steel tubing about 4 in. long, containing a spring which holds the core in place in the barrel, and it forms the connection between the core-barrel and the bit or crown. The thread at the end of the core-barrel which screws into the shell had broken off flush with the top of the latter. The core, with the exception of about ½ in. at the bottom end, was recovered without difficulty and the shell was recovered by means of a tap, cut short in order to ensure its not being too long for the threaded tapered portion to grip the shell. When the shell was brought up, it was found that the crown had broken off from it flush with the end of the shell, leaving its threaded portion within the shell.

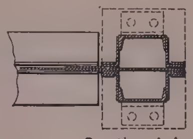
The manner in which the crown was recovered is described in a paper by Mr. C. B. Horwood, recently published by the Institution of Civil Engineers. A special tap was made for the purpose in Johannesburg. It was 6 in. long, of which length 1¾ in. was threaded to screw into the end of the bottom rod; the next 2 in. was a shoulder 2 1/64 in. in outside diameter to guide the tool and provided with longitudinal grooves to allow water to pass; and the remaining 2¼ in. consisted of a threaded tap, tapered from 1 9/16 to 1 5/16 in. in diameter. The tool was not solid, being ⅝ in. in inside diameter. It was made of steel, the end of the taper being softened to permit diamonds being set in it. Four small diamonds (about 1½ carat in all) were set in the end, in order to cut, within the crown, through and beyond the rock in which it was presumably imbedded. By the use of this tool the crown was speedily recovered. All the diamonds were found to be intact; there were 8 diamonds on the face of the crown, 4 inside and 4 outside, and also 4 inferior diamonds round the outside of the bit, to keep the hole sufficiently large to insure easy working, and to prevent the bit from becoming jammed. The carbons, when recovered, weighed 17 53/64 carats, and were valued at more than £230, or £13 per carat; moreover, having been used, their quality had been tested, and reliance could therefore be placed upon them.

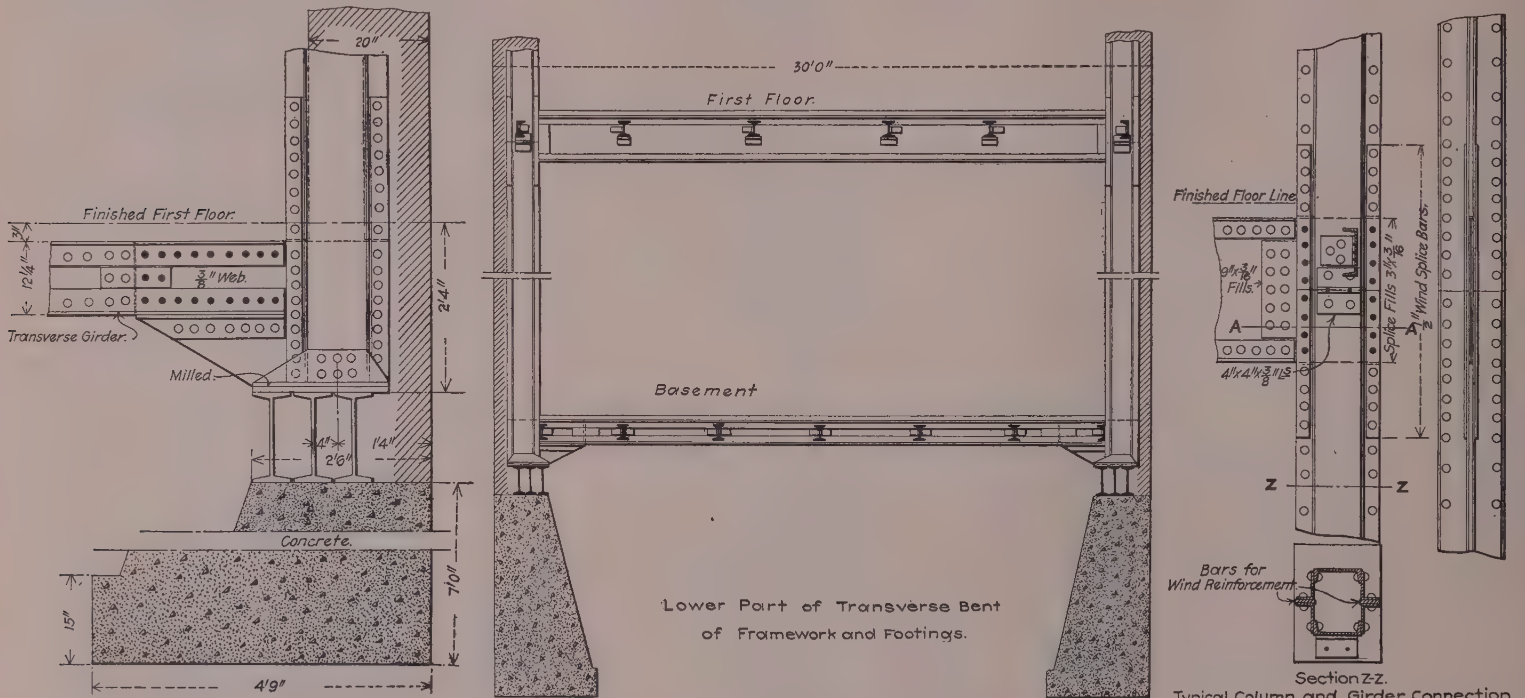
When the crown was recovered, it was found to have been very badly burned, and to be worn down to only ½ in. in depth, a new crown being ¾ in. in depth, neglecting the threaded portion. The bit having first broken off flush with the end of the shell, the two parts had been grinding against each other. As it was afterwards discovered that three rods had split at a depth of between 1,700 and 2,000 ft. from the surface, it was concluded that the pressure-water, which is forced down through the rods and returns through the clearance-space between the outside of the rods and the side of the bore-hole, had escaped where the split occurred, and so had found a quicker and easier course to the surface. Thus, no circulation of water had been taking place round the bit to keep it cool and to carry away the cuttings. The bit would thus quickly become jammed, and, probably weakened by overheating, would be unable to withstand the torsion to which it was subjected, and would therefore break.

The risk involved in the accident was that the hole might have to be abandoned entirely. This would have meant a year's work wasted; probably 9 months' delay before the same depth could again be reached in another hole; loss of the total of £230 worth of diamonds, and loss owing to depreciation of plant and machinery for one year, amount, about £8,000, spent up to that time; loss and other incidental losses.

Column and Girder Details in a Loft Building.

The 92 x 30-ft. ten-story and basement loft building at 55 West 16th St., New York, has self-supporting brick walls and independent steel columns, beams and girders. The framework was originally designed with ordinary details and connections, but afterwards the plans were replaced by a new set and the steelwork was practically redesigned with a weight about one-third less than was originally estimated. There are no intermediate columns, but there are 14 wall columns from 13 ft. 6 in. to 14 ft. 2 in. apart in two longitudinal rows 27 ft. 4 in. apart, close to the building lines. The basement columns are seated on longitudinal grillage beams which distribute their loads on the continuous concrete footings of the side walls which develop a pressure of about 7,000 lb. per sq. ft. on the dry sand. As the centers of the columns are outside the centers of the grillages, the feet of the columns are rigidly connected to transverse girders so as to virtually form double cantilevers which are assumed to take bearing on the centers of the grillages and load them symmetrically.





Cantilevered Column Footings.

Lower Part of Transverse Bent of Framework and Footings.

Section Z-Z.

Typical Column and Girder Connection.

THE ENGINEERING RECORD.

Column and Girder Construction in a Loft Building.

The floors throughout the building are intended to be suitable for storage or light manufacturing purposes and are proportioned in accordance with the requirements of the New York Building law. They have reinforced concrete arches of the White system supported in the second to the tenth tiers, inclusive, by 9-in. longitudinal beams 6 ft. apart which have standard web connections to the transverse plate girders which are riveted to the wall columns and span the full width of the building. Most of the girders are made with a 24-in. web and four 6 x 4 x ½-in. flange angles and are special in the manner in which they are connected to the columns so as to distribute the load across both sides of the column and diminish the eccentricity of loading often troublesome in wall columns of such a building. The detail here illustrated makes the column and girder practically integral at the connection, gives rigidity to resist wind stresses, and has been accepted by the building department as satisfactorily dealing with the eccentricity.

It is assumed that the building is exposed only on the upper half of its height of 120 ft. to a wind pressure of 30 lb. per square foot and the resulting stresses, together with those from the dead and live loads amount to from 276,000 lb. to 315,000 lb. in the basement sections of the columns which, like all the rest, have closed rectangular sections and are made up with a maximum of two 10-in. 15-lb. channels, four 6 x 3½ x ⅜-in. angles and two 4 x ¾-in. bars. The channels have their flanges turned in and their webs parallel to the floor girders. The girder web plates project beyond their flange angles and pass through the columns on the center lines, the 4-in. flange bars in the columns being cut to clear the web plates and the latter being field-riveted between the top and bottom angles. The column joints are made half way between the top and bottom flanges of the girders, so that the webs of the latter serve as pintle connection plates splicing the adjacent column sections. The 4-in. plates between the column flange angles are cut to clear the web plates and are spliced to the latter by outside strips shop-riveted to the plates. As the column webs are thinner than the 4-in. plates the former are fillered to engage the column angles, the inside filler plates being shop-riveted to the web and the outside fillers being shipped loose and driven in after the girder webs are entered between the column angles. The lightest column sections are made with 7-in. channels, 3 x 3-in. angles and 3 x ¾-in. bars, and where the dimensions of the shapes vary in adjacent column sections the splices differ from the one just described in that horizontal diaphragm plates are inserted between the faced ends of the column sections on each side of the girder web and are riveted to short horizontal angle clips on the channel webs, thus distributing the pressure uniformly. At the feet of the columns the pintle plates are shop-riveted to the columns and extend beyond them to form part of the pedestals integral with the columns and afford connections with the cantilever girders. The girder is ¾-in. thick and is cut shorter than its flange angles so that the latter form jaws engaging the projecting pintle plate which is spliced to the web by cover plates.

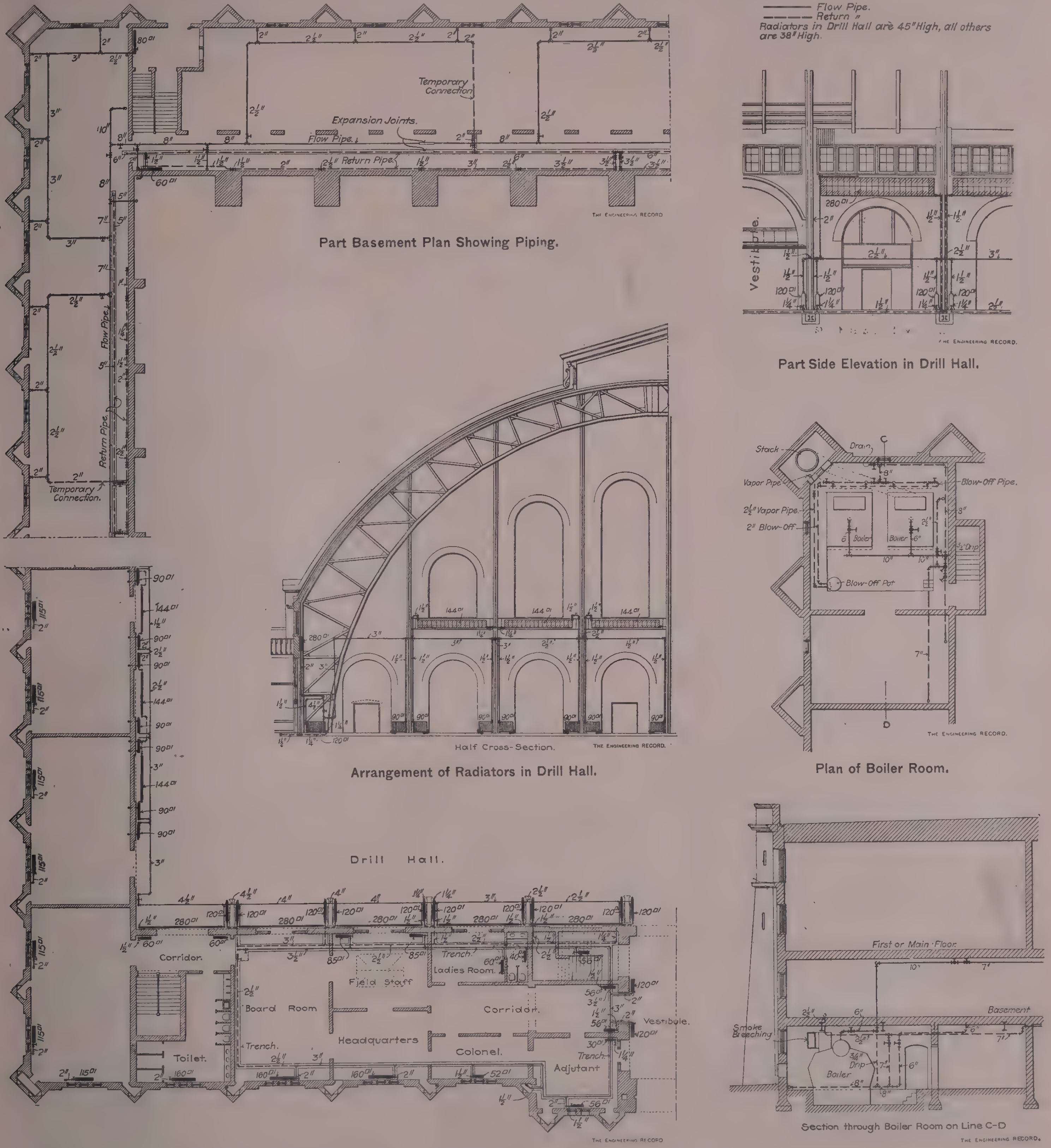
The principal advantages claimed by the designers for these column and girder details are, 1, avoiding eccentricity of column loads; 2, action of all rivets in shear only; 3, the most effective disposition of metal to resist wind stresses by placing the 4 x ¾-in. plates between the angle flanges at the greatest possible distances from the neutral axis; 4, economy of metal, and 5, facility of erection. The pintle connection is the subject of a patent granted in 1898 to Mr. L. L. Calvert.

The steelwork was erected by ten men at the rate of 1½ tiers in eight hours under the most favorable conditions, a rapidity which was considered materially greater than could have been attained with ordinary connections and column splices. All the steel was hoisted from the street by a stiff leg 45-ft. boom derrick operated by a Mundy hoisting engine in the lower part of the building, and was assembled by it and by a movable jinnniwink derrick in the rear of the building, operated by a hand windlass. All rivets were driven by Chicago pneumatic hammers, operated by an Ingersoll-Sergeant air compressor. The Tidewater-Building Co., Mr. L. L. Calvert, chief engineer, is the general contractor for the building, and the Levering & Garrigues Co. is the contractor for the 200 tons structural steel.

Heating System of the Fifth Regiment Armory, Baltimore, Md.

The equipment of the large new armory of the Fifth Regiment, Maryland National Guards, at Baltimore, Md., offered interesting problems as to both the heating and the lighting, on account of its size. This building occupies the whole of a 354 x 284-ft. lot, and is built to form a hollow square with the large drill hall, covered by an arched roof, occupying the entire center court. The drill hall, having an unobstructed floor area of 199 x 293 ft., with a clear height under the roof arches at the middle of 86 ft., has an interior volume to be heated of over 4,000,000 cu. ft. Besides this there is the 2-story structure surrounding the drill hall area, averaging 40 ft. wide on either side and 27 ft. wide at the ends, which provides quarters for the administration, reception, staff and board rooms, for the officers' and company rooms, corridors, toilet rooms and a large gymnasium. The construction of this structure was described in detail in The Engineering Record of May 14, 1904.

The heating equipment has been designed on the low-pressure, direct-radiation system throughout the entire building. In the drill hall two radiators with 90 sq. ft. heating area each are installed alongside the base of each of the arch roof trusses, while at the ends two 120 sq. ft. radiators are similarly located beside each end wall column. These are supplemented by banks of radiators suspended on the walls, some distance above the floor, immediately under the ranges of side windows; those on the end walls are in banks of 144 sq. ft. each and located 28 ft. above the floor, while those on the side walls are in banks of 280 sq. ft. located 23 ft. above the floor.



Part Basement Plan Showing Piping.

Part Side Elevation in Drill Hall.

Arrangement of Radiators in Drill Hall.

Plan of Boiler Room.

Section through Boiler Room on Line C-D

Details of Heating System of the Fifth Regiment Armory, at Baltimore, Md.

It is interesting to note the total heating surface that was provided in the drill hall. Each end wall has 14 radiators of 90 sq. ft. heating surface and 6 banks of 144 sq. ft., making a total for both ends of 4,248 sq. ft. Each side of the hall is provided with 20 radiators of 120 sq. ft. and 10 banks of 280 sq. ft., giving a total for both sides of 10,400 sq. ft. The grand total for ends and sides is therefore 14,648 sq. ft. or approximately 1 sq. ft. per 300 cu. ft. of interior volume. The radiators in the drill hall are connected on the two pipe system, while those in the outer rooms, corridors, basement, etc., are operated upon the single pipe system.

Steam is supplied by two side-fired Worthington water-tube boilers with brick bases, located in a sub-basement boiler room at one corner of the building. Each boiler has 1,500 sq. ft. of heating surface and is designed for a working steam pressure of 125 lb., although only low pressure will be required for the heating service. The boilers are intended to operate electric light engines to be installed in the future, in which case exhaust steam will be used for heating. The arrangement of the boilers, piping and auxiliary equipment in the boiler room is shown in an accompanying drawing.

Each boiler is provided with a 2-in. boiler feed connection and also a 2-in. blow-off with two valves in series, one being an asbestos-packed blow-off. The blow-offs deliver into a 30 x 42-in. cast-iron blow-off pot, from which a 2½-in. vent rises through a concealed vent shaft to the roof. The boilers are each connected through a 24 x 36-in. breeching with a smokestack in the vent shaft; this stack is of ⅜ and ¼-in. tank steel, 42 in. in diameter and rises about 66 ft. above the boiler room floor. The draft is controlled by a Kieley damper regulator.

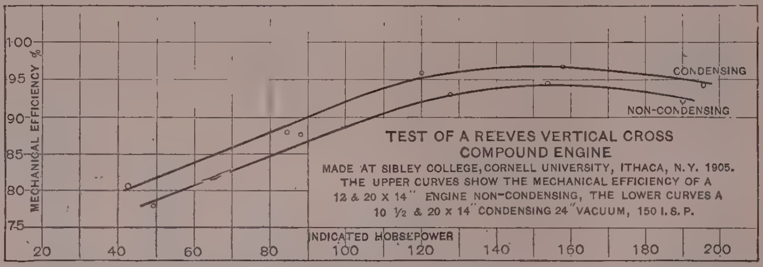
Steam is supplied to the heating mains by a 10-in. riser from the boiler room to the ceiling of the basement floor above, where the system divides into two branches. These lines, each of which are of 8-in. pipe at first, diminishing further on to 7 and 6 in. in size, are carried on the basement ceiling and connect with branches, from which the riser connections through the floor to radiators are easily made. The arrangement of these connections is shown in the basement half plan. At the four corners there are 5-in. riser connections to supply the drill hall radiators; these rise to about 4 ft. above the floor, where a 3-in. branch is taken off and carried up about 25 ft. to supply all radiators at the gable end, while the main is carried up about 10 ft. as a 4½-in. extension and is from there carried over to supply all radiators at the sides, as shown.

The returns from the drill hall radiators are collected into a pipe system similar in layout and pipe sizes to that for steam. These return lines are in some places carried upon the basement ceiling, but usually in trenches in the basement; they approach the boiler room by 5 and 6 in. lines laid in covered trenches, and dropping into the boiler room, unite into an 8-in. connection to the boiler blow-off line for direct return to the boiler. The return main is provided with drain valve for drawing off for repairs. The trenches for the return mains have ½ in. diagonally channeled cast-iron cover plates. The heating and lighting plant was designed by Adams & Schwab, consulting engineers, Baltimore, and installed by the Hubbard Heating Co., of Washington, D. C.

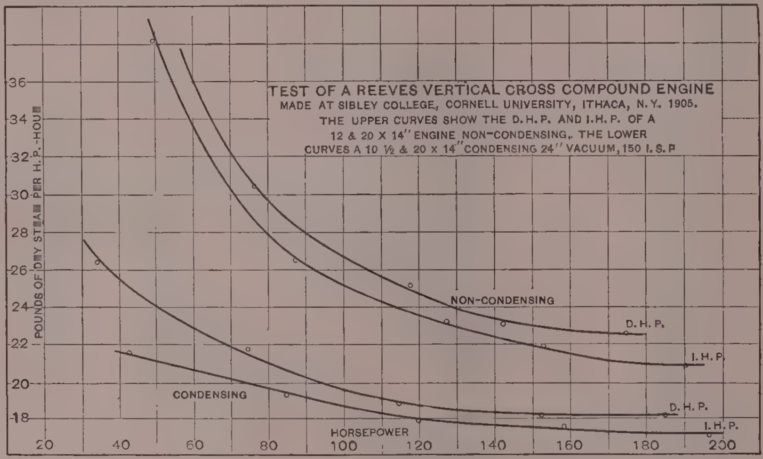
A Large Tower 560 ft. high has been designed by N. Le Brun & Sons for the Metropolitan Building on Madison Square, New York. Its site is in a 150 x 175-ft. corner of the building now occupied by a church, and its construction will make the building one of the most conspicuous in the world; it is already one of the largest.

Tests of a Vertical Cross-Compound Engine Under Varying Loads.

About a year ago there was published in this journal a description of the Reeves vertical cross-compound engine, and the data then given can now be supplemented by tests of a 12 and 20 x 14-in. engine of this type conducted at Sibley College, Cornell, by Prof. R. C. Carpenter, assisted by Prof. H. Diederichs. In this engine steam is admitted to the high pressure cylinder by a piston valve which takes steam from the inside edge. This valve is under the control of a Rites shaft governor. The steam exhausted from the high pressure is admitted to the low pressure cylinder by two piston valves of identical design, operated by an eccentric from the engine shaft. There is no receiver, and the steam from one end of the high pressure enters the same end of the low pressure. All the piston valves are so designed that, by means of expansion rings, wear can be taken up at either end of the valve by adjustment from the head end only, making it necessary to remove but one valve chest cover for each valve. Cylinders and valve chests are well lagged, and lubrication in the cylinders is taken care of by sight feed lubricator and hand pump.



Mechanical Efficiency of an Engine Run Condensing and Non-Condensing.



Developed and Indicated Horse Power of an Engine Run Condensing and Non-Condensing

Lubrication of bearings is taken care up by a central oiling system, all oil pipes leading from a tank placed at the side of the cylinders. By this means, once the oilers are set, lubrication can be watched from one point.

The engine was connected through about 25 ft. of 4-in. pipe to two Babcock & Wilcox boilers. This pipe was one size too small, but was the largest that could be obtained for connection. In order to minimize the effect that the resulting high steam velocity would have, a piece of 6-in. pipe about 30-in. long was interposed to act as a sort of reservoir just ahead of the throttle valve. About 20 ft. of 7-in. pipe connected the engine to a Wheeler surface condenser.

A Carpenter throttling calorimeter placed beyond the throttle valve served to determine the quality of steam. The steam pressure was determined by a gauge connected next to the calorimeter. The speed was found by a continuous counter, and by hand counter as a check. The continuous counter readings were used in the calculations as being absolutely correct. One Thompson indicator was connected to each cylinder, taking cards from each end by means of a three-way cock. Motion for the indicators was obtained by fastening a rod to each cross-head, the stroke being reduced by means of a reducing wheel fastened to each indicator. The condensed steam was pumped by the air pump alternately into two tanks on scales. Readings of condensed steam weights were taken every five or ten minutes, as the load demanded.

For the purpose of test the engine was fitted with a fly-wheel 5 ft. in diameter on the low pressure side. Upon this wheel was placed the Prony brake for the determination of the developed horse-power. This brake was, in all respects, of the ordinary standard design, the strap being of steel plate, fitted with wood blocks on the inside. The wheel was kept as cool as possible by running cold water constantly into the flanged rim, and taking it out by a scoop. A steady small stream of cylinder oil led under the strap helped considerably in the smooth operation of the brake. By these arrangements as much as 185 d. h. p. were taken off one brake.

For the condensing series as high a vacuum as could be obtained was carried. This averaged about 24 in. For the non-condensing series the air-cock on the condenser was kept open, insuring condensation under atmospheric pressure.

Indicated horse-power was computed from the well-known formula: $I. H. P. = p\ l\ a\ n \div 33{,}000$, where p = mean effective pressure, l = piston travel in feet per minute, a = area of piston in square inches, and n = revolutions per minute; p was determined from the indicator cards. Depending upon the load, the indicator springs were changed. For the condensing runs the engine dimensions were 10½ in. and 20 in. x 14 in.; for the non-condensing runs, 12 and 20 x 14 in. This change was effected by taking out a liner from the high pressure cylinder. These dimensions make the cylinder ratio in the first case 3.60; in the second, 2.75.

The developed horse-power was found from the brake constants by means of the formula, $D. H. P. = 2\ \pi\ g\ a\ n \div 33{,}000$, where g = net loads in pounds, a = brake arm in feet, and n = revolutions per minute.

By a substitution of brake constants, the formula reduces to $D. H. P. = 0.001492\ n$ for every 100 lb. of net brake load.

The steam consumption per I. H. P. and per D. H. P. for various loads and steam pressures is computed on the basis of dry steam.

For the purpose of facilitating inspection of results and discussion, the water rates and mechanical efficiency are plotted on the accompanying curve sheets. Two things are to be noted about these curves. The cut-off even at the high loads does not seem to be late enough to cause any marked rise in the steam consumption at overloads. In fact, in most cases little or no rise could be determined. Again, the curves show good economy over a wide range of load. The mechanical efficiency curves show a steady increase with the load at any given steaf pressure. On the overloads the efficiency falls off but slightly.

Test of a Steam-Turbine Driven Centrifugal Pump.

An interesting test of a steam-turbine driven centrifugal pump was referred to in one of the discussions at the recent spring meeting of the American Society of Mechanical Engineers at Scranton, Pa., by Mr. Charles R. Rearicke. In reference to an account of an engine-driven centrifugal pump having a capacity of 20,000,000 gallons for 24 hours, in which a duty of 90,000,000 ft. lb. per 1,000 lb. of dry steam could be expected, Mr. Rearicke mentioned the actual results of a 24-hour duty trial of a De Laval steam-turbine driven centrifugal pump, made April 21 and 22, 1905, at the Mt. Prospect Pumping Station, Brooklyn, N. Y. The pump was designed for a capacity of 6,0000,000 gallons in 24 hours and for 175 feet total head; the turbine for 150 pounds steam and 28 inches vacuum, no superheat. The turbine is the regular De Laval simple-wheel type running at 10,500 r.p.m. and geared down to 900 r.p.m. for the pumps. The pump is of the two-stage series type. The test was started at 4 p. m. April 21 and completed 4 p. m. April 22, and was conducted for the city by Mr. R. P. Bolton. All readings were taken every 10 min.; all steam passing through the main pump and auxiliaries was condensed and weighed, together with the drips. The discharge from the pump was measured by a Venturi meter; all gauges were checked for accuracy by use of a mercury column after the test and results corrected to correspond, and the figures were, therefore, considered trustworthy. The results as reported by Mr. Bolton are as follows:—

TEST OF DE LAVAL TURBINE-PUMP.

Speed of pump runners (impellors)	907⅓ r.p.m.
Water from condenser (steam used by turbine pump)	104,551.5 lb.
Turbins drips	1,240.5 “
Heater drips (steam used by air-pump)	2,180. “
Total condensation	107,972. “
Percentage of moisture in steam	1 11/100 %
Dry steam supplied to turbine and auxiliaries	106,773.51 lb.
Steam pressure	145.83 “
Vacuum	28.84 in.
Heat in steam	127,360,084.323 B.t.u.
Feed water heated = 3,402.252 cu. ft. at 61.843 lb.	210,405.47 lb.
Temperature of feed-water entering heater	45.078° F.
Temperature of feed-water leaving heater	113.343° F.
Temperature increase	57.265° F.
Heat returned in feed-water	12,073,276.274 B.t.u.
Neat heat charged to apparatus	115,287,439.266 “
Discharge head (per sq. in.)	79.496 lb.
Suction head (per sq. in.)	5.157 “
Net head (corrected for difference in gauge levels	173.469 ft.
Water pumped = 6,546,899 gal. at 8.34 lb.	54,601,137.66 lb.
Work done (ft. lb.)	9,471,604,748.842
Duty (ft. lb. per million B.t.u.)	82,156,433.33

Referring to the above it will be found that the duty per 1,000 lbs. of steam, including all auxiliaries, was 88,707,440. We can also deduct the following from the above:

Dry steam supplied to turbine pump only	103,391 lb.
Dry steam supplied to turbine pump, including turbine drips	104,631 “

From this it will be seen that the duty of the turbine pump exclusive of the drip was 91,609,567 ft.-lb., and that the duty, including the drips from the turbine, was 90,523,866.30518. It will be noted that a 28.8 vacuum was maintained in the turbine case. While this is somewhat in favor of the turbine the machine was nozzled for 27½ in. vacuum and consequently did not get full benefit of the great increase in vacuum over what it was designed for. With 200-lb. steam pressure, 28-in. vacuum and 100° superheat, Mr. Rearicke stated that the efficiency would be bettered in practice to such an extent that the duty would figure 103,000,000 ft.-lb.

Book Notes.

Amateur painters have often wished for an elementary handbook describing the correct method of preparing and using paints for small buildings and such work. They will find considerable assistance in C. Godfrey's "How to Mix Paint," which is written for those who are without experience. It gives ample directions for selecting, using and caring for brushes, but most of the pages explain the method of matching colors. The exact proportions of the different ingredients are not given because the colors on the market vary so greatly in strength that this is impracticable. Materials of ordinary quality are accordingly assumed, and the instructions are so worded that any variation in their quality does not cause a change in the methods suggested for mixing them. (New York, Industrial Publication Co.; cloth, 16-mo, 50 cents.)

The report of the Committee on Standard Methods of Water Analysis of the American Public Health Association has been published in pamphlet form by the "Journal of Infectious Diseases" of Chicago, so as to make it available as a desk manual in the laboratory. The committee which made this report consists of Messrs. Geo. W. Fuller, chairman; Geo. C. Whipple, secretary; H. W. Clark, Edwin O. Jordan, H. L. Russell, J. W. Ellms and Robert Spurr Weston. If the methods outlined are conducted carefully in all our laboratories there is no question but what the data secured concerning American water and sewage conditions will become of great benefit. Of course improvements in the methods recommended by the committee will be made; in fact, the work at the Columbus Testing Laboratory has proved this; but in general the methods outlined in this manual will prove invaluable to the water analysts of the country.

The "Annual Statistical Report of the American Iron and Steel Association" for 1904-5 is more comprehensive than previous numbers and has the same authoritative value. The statistics of iron and steel production are complete, of course, and the same is true of the data on foreign trade in ore, iron and steel. The statistics concerning Lake Superior ores, Connellsville coke, rail production and the prices of finished products in the United States and elsewhere have been materially amplified for this report. The character of this publication is so well known that it is unnecessary to review it at any length. The data show that 16,497,033 tons of pig iron were produced in 1904, 1,512,219 tons less than in 1903. It is interesting to observe that in this period there was an increase in basic pig and a decline in Bessemer iron. The production of Bessemer steel was 7,859,140 tons in 1904, 8½ per cent. under the previous year's output. A significant feature of late has been the construction of a number of small Bessemer plants for making steel castings. There were 5,908,166 tons of open-hearth steel made in 1904, an increase of 1.3 per cent. over the 1903 output. Of this total 5,106,367 tons were made in basic furnaces. The production of rails was 2,284,711 tons, and of structural material 949,146 tons. (Philadelphia, James M. Swank, $5.)

One of the best practical engineering books by an American author is Mr. Charles Evan Fowler's "Ordinary Foundations," which has been thoroughly revised by the author and now appears in an enlarged form, covering practically all sorts of foundation construction. Of course no book can teach a man to put in foundations both economically and safely, for such work sometimes requires the most careful consideration by engineers of long experience; but a careful reading of Mr. Fowler's suggestions will reveal the many sources of trouble that may arise and thus instill an idea of the need of conservative caution. The amount of money wasted annually in holes in the ground and poor piling, through lack of attention to the special problems of foundation work, is very large, and a study of this book ought to prevent a lot of it. A word ought to be said, also, for the author's willingness to take from a busy professional life the time necessary to make the many additions to the book which first appear in this edition. (New York, John Wiley & Sons; cloth, 8vo, 340 pp, $3.50.)

The 1905 edition of the "American Street Railway Investments," otherwise known as the electric traction Red-Book, has just appeared, being the twelfth annual edition of this manual, which is recognized as the authority on financial statistics of American street railway companies. The book contains 415 pages of statistical matter and is 53 pages larger than the edition of 1904. This increase has been due in part to the addition of reports from new roads, but more largely to the fact that many roads have furnished a statement of earnings this year, from which such figures have not heretofore been obtainable. Among the new features in the manual this year is an increase in the index, which is bound in the back of the book. Heretofore only the names of the companies reported have been included in the index. This year the index has been enlarged to include the names of all underlying companies which have bonds outstanding, even though the company may not at this time have any separate corporate existence. This enables investors to refer readily to the report of the company which now operates the road of any former company. As usual, the introduction to the book contains a summary of the gross receipts for the last two years of the principal companies reporting. As there have been many consolidations during 1904, this table is not an exact index of the growth of the business, as the figures in a number of cases represent receipts for a larger amount of trackage. Nevertheless, the increase is such a steady one as to indicate a substantial gain in street railway earnings for the past year. (New York, McGraw Publishing Co., $5.)

ELEMENTS OF GENERAL DRAFTING FOR MECHANICAL ENGINEERS. By C. E. Coolidge and H. L. Freeman. New York, John Wiley & Sons; cloth, oblong 4to, 55 pp, 21 folding plates, $2.50.

Although books on drafting are falling on the reviewer's table like leaves in autumn, the volume bearing the above title has so many unusual features that it deserves special attention. It is manifestly intended for use in a college classroom, and the authors state that it outlines a 200-hour course conveying "the essentials of modern conventional drafting as practiced by the general profession of mechanical engineering." No engineer in active practice would write a book so full of precise directions that the reader begins to expect, before proceeding very far in it, that he will come across suggestions for the shade of neckties agreeing most closely with drawing-room ethics. The makers of the paper, pencil and erasers to be used are specified without apparent consideration for the fact that there are other equally good brands of such supplies. Yet this very precision and assumption of absolute certainty is a good thing in teaching beginners. They will get a certain amount of practical information before doubts concerning any part of the instruction arise to make them less enthusiastic about their work. This dogmatism may seem amusing to experienced draftsmen, but, shown in moderation, it is a decidedly good thing in the classroom.

The book is in two parts. The first gives the course in drawing, beginning with copies of working plans of simple objects, then passing through the preparation of working drawings from sketches, the construction of assembly drawings from sketches, and copying commercial drawings, to the preparation of Patent Office drawings. The course seems to be intended to give with the practice in making drawings an idea of the way drawings are developed in a shop office from sketches and some facility in grasping quickly the form and size of the pieces represented in an assembled form in drawings of machinery.

The second part of the book describes the selection, use and care of materials and instruments. The authors state that they have acquired data from 130 large shops for the purpose of presenting an average system of drafting-room technique. The information they give is unusually good, and if it lays great emphasis on a few trifling details no harm is done. The book is a good one, particularly for the classroom, and forms an appropriate introduction to Mr. Charles L. Griffin's "Elementary Text-book on Machine Design," a work that is indispensable in a drafting-room.

SELF-PROPELLED VEHICLES. By James E. Homans. New York, Theo. Audel & Co.; cloth; 8vo, 660 pp, $2.00.

It is doubtful if more than a very small percentage of the owners of automobiles have any knowledge of their construction. In a general way they are acquainted with the external appearance of their cars, and, with the aid of Roberts' "Automobile Pocketbook" are able to make the book with reasonable care. It is, of course, no summer novel, but it is clear as the subject permits. Moreover, it is almost up to date, which is a great advantage.

The manner in which the subject is developed is diametrically unlike that of the trade publications, which bewilder the reader by beginning with the motor and its accessories. Mr. Homans begins by showing how a motor carriage turns and is steered, and thus explains at the beginning some of the features of construction that few drivers understand. Then he describes the underframes, springs, jointed shafts, wheels and tires. It is thus possible to take up brakes next without confusing the reader, and then to describe ball and roller bearings and the nature and use of lubricants. After covering this ground the reader is able to study the motor and transmission gear with full knowledge of the reason for elementary adjustments of such parts as get out of order on the road, but they have no real knowledge of the mechanism. The reason for this is undoubtedly because the people who possess such information envelope it in such a haze of technical terms when they put it in writing that the average man prefers to hire a chauffeur or to remain in blissful ignorance. As a matter of fact there is nothing at all mysterious about any car; the large steam vehicles are somewhat complicated, but none of them cannot be understood if their construction is taken up systematically.

One of the best books for the car owner is that written by Mr. Homans. Its merit is threefold; it is free from technical terms other than those any car owner should understand, it presents the subject in an orderly manner, and it gives details of the construction of many types of cars, so that the reader can secure a pretty good idea of the whole field of automobile construction if he will take the trouble to study the features of design peculiar to such vehicles. Gasoline motors, steam equipment and electric outfits are explained in detail and illustrated by cuts showing the construction of many of the leading American and foreign machines. This portion of the book is as complete as a non-technical explanation can be made, and if the author is somewhat inclined to underrate the best steam cars he does so in company with most automobilists. As a matter of fact the "steamer" is an excellent car when well built and properly managed by somebody thoroughly acquainted with its construction; and its disadvantages appeal more forcefully to those unacquainted with the care of steam engines than to experts who do not look with suspicion on a few extra gauges and levers.

Letters to the Editor.

CALIFORNIA OIL ASPHALT.

Sir: I was somewhat surprised at the admission to your reading columns of the communication signed "California Asphaltum Sales Agency." Lest some of your readers may be misled by the personal insinuations therein, will you allow me space to say that I am not financially interested in any asphalt business nor in any kind of asphalt; that I am not retained or employed by, nor under obligations to, the owners, agents or promoters of any variety of asphalt; and that for the opinions, right or wrong, which I may hold or express regarding asphalts and asphalt pavements I alone am responsible; they are neither dictated nor inspired by others.

Yours very truly, S. WHINERY.

[Mr. Whinery's connection in an advisory capacity with the Highway Department of the Borough of Manhattan, which has been vigorously opposing the use of oil asphalt, probably led to the rather indefinite statement to which he takes exception. The intention of the writer was doubtless to say that the views of Mr. Whinery are more favorable to materials of one class than another, a condition which is true of consulting engineers in all specialties.]

MAPPING UNDERGROUND STRUCTURES.

Sir: You have occasionally referred to the importance of compiling records of the underground structures of all classes which infest the streets of our cities. It seems to me that the time has come when more attention should be paid to this subject by the authorities. The situation has become so troublesome to all interested in the maintenance of the pavements and the works beneath them, that a joint organization for a sub-surface survey would be profitable in most large cities. Water, gas, sewer, telephone, electric light and other pipes and conduits have become so interlaced and occasionally forgotten that it is a difficult task to find any one of these works without tearing up a lot of pavement and exposing an unnecessarily large number of pipes. It is bad enough to tear up a pavement in a residential portion of the city, but in a crowded business thoroughfare the interference with important traffic, the expense and difficulties of the work, and the final replacing of the pavement satisfactorily, are all so difficult that this kind of work should be kept as low as possible.

The only way to accomplish this satisfactorily is to make a survey of all the underground pipes and conduits. The quickest and most accurate way to secure the data is for all the public and private interests to adopt some mutual system of exchanging data, which will be plotted by men organized into a bureau for this purpose. Blanks can be furnished to the inspectors of the companies and the public departments, on which a record can be kept of all the underground structures uncovered in every excavation made in the city. In this way the maps prepared in the bureau having the work in charge can be checked up continually, and the numerous errors in the old records can be detected. It will also be possible to discover those sections where the records are incomplete, and, if the underground structures are important at such places, special examinations can be made. By united action in this way good maps can be obtained without much expense to any of the interests which need them.

Yours truly, DEPARTMENT ENGINEER.
New York, June 24.

SMOKE AND ECONOMICAL COAL CONSUMPTION.

Sir: In looking over your issue of June 17, containing comments on papers delivered before the recent spring meeting of the American Society of Mechanical Engineers, I observe that I am quoted as stating in discussion offered to the paper by Prof. Benjamin, that smokeless combustion does not insure greater economy, therefore I wish to make my position clear in this connection, because I have been a very vigorous advocate of smokeless combustion for the sake of economy. I do not mean, however, that I consider it advisable to waste more heat by excessive air supply than can be saved by the additional combustion caused thereby, but that a properly developed condition will produce perfect combustion and consequent economy.

There have been many statements made about the very small loss which occurs in the black carbon particles which give color to the gases. I am not disposed, neither do I consider it necessary, to discuss this particular phase of the matter, but I do wish to call attention to the fact that the loss occurring with a smoky condition is very much under-estimated, because hydrocarbon gases which escape under such conditions are seldom or never taken into consideration, one reason being the very great difficulty of the chemical analysis required to show their presence. To illustrate, let screenings be taken from Illinois coal, for example, containing 10,000 B.t.u. per pound. These may be burned under a water-tube boiler so that gases pass immediately from the fire among the tubes. Under such conditions the volume of the gases per pound of coal may be as large as 450 ft. with a quite smoky condition. With such condition one foot of CH_4 may be present in these gases, which would be only 0.22, or less than ¼ of 1 per cent. of the total volume, yet this one foot of CH_4 has a heating value of 1,000 B.t.u.; or, in other words, 10 per cent. of the heating value of the fuel.

In reference to the advantages of stokers, the remark make by Mr. Ambrose Swazey is strictly to the point, because he calls attention to the fact that it is very difficult to get the men to manipulate the fire the way the machine will do it. One of the difficulties in this matter is, that we attempt solution of very complicated problems without sufficient knowledge or experience.

Very truly yours, A. BEMENT.
Chicago, June 20.

LARGE REINFORCED CONCRETE WAREHOUSES have been constructed at the new Salford dock of the Manchester ship canal. There is a central 450x100-ft. building and two on each side of it, each measuring 425x110-ft. They are three stories high and designed in accordance with the Hennebique system by Mr. L. G. Monchell.

CURRENT NEWS SUPPLEMENT

JULY 1, 1905.

DIRECTORY OF NATIONAL TECHNICAL SOCIETIES.

American Society of Civil Engineers. Secretary, Chas. Warren Hunt, 220 West 57th St., New York.

American Society of Mechanical Engineers. Secretary, F. R. Hutton, 12 West 31st St., New York.

American Institute of Electrical Engineers. Secretary, Ralph W. Pope, 95 Liberty St., New York.

Association of Engineering Societies. Secretary, W. H. Merrill, Jr., Chicago.

American Institute of Mining Engineers. Secretary, R. W. Raymond, 99 John St., New York.

American Institute of Architects. Secretary, Glenn Brown, Washington, D. C.

Association of Engineering Societies. Secretary, Frederick Brooks, 31 Milk Street, Boston, Mass.

American Society of Heating and Ventilating Engineers. Secretary, W. M. Mackay, 235 Water St., New York: Annual meeting, Chicago, July 7 and 8.

Canadian Society of Civil Engineers. Secretary, Clement H. McLeod, 877 Dorchester St. Montreal.

Society for the Promotion of Engineering Education. Secretary, Prof. M. S. Ketchum, University of Colorado, Boulder, Colo.

American Society for Testing Materials. Secretary, Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Municipal Improvements. Secretary, George W. Tillson, Room 12, Municipal Building, Brooklyn, N. Y. Annual meeting, Sept. 5-9, Montreal.

Association of Railway Superintendents of Bridges and Buildings. Secretary, S. F. Paterson, Concord, N. H.

American Railway Engineering and Maintenance of Way Association. Secretary, L. C. Fritch, 1562 Monadnock Block, Chicago.

American Water-Works Association. Secretary, J. M. Diven, Charleston, S. C.

American Foundrymen's Association. Secretary, Richard Moldenke, P. O. Box 432, New York.

Engine Builders' Association of the United States. Secretary, J. L. Lyle, 39 Cortlandt St., New York.

American Public Works Association. Secretary, W. H. Flint, Chattanooga. Annual meeting, Chattanooga, Aug. 30-31.

A 25-KILOWATT ELECTRIC UNIT.

The generating set shown in the accompanying illustrations consists of a 9 x 8-in. automatic engine connected to a compound-wound generator, furnishing 25 kw. at 350 r.p.m. and 90-lb. steam pressure. These units have been specially designed under the specifications of the Navy Department. The cylinder is an independent casting and is provided with relief valves at both ends. A partition between the cylinder and frame prevents any water from the piston rod stuffing box reaching the interior of the frame. A balanced piston valve is used, controlled by a Rites governor. Lubricating oil is forced under 10 to 20 lb. pressure by a pump driven from the main shaft, into the main bearings, crank-pin, cross-head pin and cross-head guide. The thorough enclosure of the engine prevents any splashing of the oil into the engine room. The generators are multipolar and are designed to carry 50 per cent. momentary overload without shifting of brushes or sparking at the commutator, and 25 per cent. overload for two hours without sparking or overheating. These sets are made by the B. F. Sturtevant Co., Hyde Park, Mass.

The Koerting and Hornsby-Akroyd internal combustion engines are illustrated in a number of circulars issued by the De La Vergne Machine Co., New York. Views of the 1,000 and 2,000-h.-p. Koerting gas engines at the plant of the Lackawanna Steel Co., at Buffalo, are shown and also of the standard Koerting engines. The new portable Hornsby-Akroyd oil engine with direct-connected air compressor for steel erectors' and general contractors' use is illustrated in a special bulletin, which should be of interest to all having use for compressed air in temporary work. Additional circulars show the well-known De La Vergne refrigerating machines as arranged for steam, electric and power driving.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

In the last number of this journal a report was given of the first part of the discussion on the proposition to establish local branches of the Society in different sections of the country. On Thursday morning the matter was again brought up by President Schneider, who stated that it had been originally introduced only to call out an expression of opinion from the different sections of the country and that no definite action could be taken on it at that time. It was finally decided to request the Board of Direction to keep the matter before the members for further discussion, as stated in the telegraphic report printed last week.

At the annual meeting last winter Mr. Samuel Whinery introduced a motion to empower the Board of Direction to recommend members of the Society for service on special commissions, when the Board was requested to take such action. The motion was introduced for the purpose of having the subject carefully considered, rather than as a definite expression of opinion by the members present at that time. The report of the Board on the subject, which was presented on Thursday, was substantially as follows:

A NEW TWENTY-FIVE-KILOWATT GENERATING SET.

The Society will best serve not only its members and the profession, but also the public, by limiting its activities as an organization to objects laid down in the constitution, viz., the advancement of engineering knowledge and practice and the maintainance of a high professional standard among its members. To attain these objects provision is made for meetings for social and professional intercourse, the presentation and discussion of papers, the publication of papers and the maintenance of a library. No action to promote the personal welfare of members other than that resulting from the means specified is provided for; on the contrary the true intent of the Society is shown in a definite prohibition of papers advocating personal interests. To furrther guard and perpetuate an impartial and impersonal attitude, every publication is preceded by a statement that the Society is not responsible for facts and opinions advanced by members. It has been determined that in pursuance of its aims, the Society may confer upon its members who contribute papers elucidating marked advances in principles and construction permiums commemorative of such contributions and many alone or in co-operation with other organizations take steps toward the formulation of expressions of opinion as to the best methods of securing uniformity of practice on engineering problems of any particular class, and the form in which results of such investigations should be presented in order to be compared. The care to be taken in the selection of the members of the Society to take part in the formulation of such methods and procedures is evidenced by the provision of the constitution on the subject, which shows the caution with which the Society approaches any question of taking an action which may lead to even a nominal expression of opinion on an engineering subject concerning which diverse opinions may be entertained. Such a subject must be considered by the Board and also by the Society in a general meeting, which can only by a two-thirds vote direct the Board to obtain an expression from the Society by ballot. Finally the ballot fails unless an unusually large number shows interest. This deliberate mode of procedure was adopted only after careful consideration. At the same time the policy of the Society with reference to such special committees was determined, the question now arisen again of the propriety of the Society taking part in the appointment of commissions to investigate subjects of local interest was also thoroughly canvassed with the result that in the convention of 1876 it was resolved that it is inexpedient for officers to take action upon the application for members to perform professional services. This has been the sentiment for twenty-five years and no reason exists for a change. Adherence to this policy has resulted in an advance in efficiency and in freedom from imputation of being an association for the promotion of the pecuniary or personal interest of members.

It is certain strong influences, both external and internal to the membership, would be brought to bear on the agency through which the selections would be made, and such influences would occasionally extend even to the composition of the appointing agency.

Furthermore it is certain that the selection by the Society of persons to perform certain duties, with no control by the Society over the manner in which such duties may be performed, cannot be looked upon as furthering the advancement of engineering knowledge and practice. The Board of Direction is therefore of the opinion that the nomination by the American Society of Civil Engineers or by its officers of persons to serve on technical or other commissions, or to render special professional services, does not come within the scope of the purposes for which the Society was organized and exists, and that the making of such nominations is not advisable.

On motion of Mr. James Owen, the report was adopted.

The ballot taken to obtain an expression of opinion concerning the place for the convention of next year indicated a preference for Duluth; the subject was referred, as usual, to the Board with power to settle it.

Mr. Robert Moore reported on the Society's exhibit at the Louisiana Purchase Exposition, which received a grand prize. He stated that the expense was less than $8,000 appropriation for the purpose. A report on the International Engineering Congress was read by Mr. McMinn, assistant secretary, in the absence of Secretary Hunt, who was prevented by sickness from being present.

Appropriate action was taken on the death of Messrs. Wellman and Morgan in the wreck at Mentor, and on the courtesy of the Erie R. R. Co. in furnishing free transportation over its lines to the members attending the convention.

Wednesday was devoted to visiting several public places of engineering interest and several of the leading manufacturing plants. The Entertainment Committee adopted the novel plan of holding a short session in the morning and the Society was addressed by several gentlemen who described the institutions which were visited later.

Major D. C. Kingman described Cleveland's harbor, river and breakwater. The city was handicapped by insufficient harbor facilities, but this condition was being overcome. He said the shipping facilities of a port depended upon the ability to bring trains alongside vessels so that transferring of freight could be done with a minimum amount of handling. Instead of utilizing the lake front Cleveland's shipping had followed the course of the crooked and shallow Cuyahoga River. Although there are some 20 miles of navigable river front within the limits of the city, business is being diverted away from Cleveland because the modern 500-ft. freight carriers cannot enter the harbor and river. The annual lake shipping of Cleveland is about 10,000,000 tons. Formerly it was the largest port on the lakes, but now it is falling behind for the reasons mentioned. The present government breakwater is something over a mile long, and built of rock and piling with timber top. A few years ago the timber top was removed and broken stone and concrete substituted. The combination of a timber piling below and concrete top is a peculiar one and a light sea is sufficient to cause quite a perceptible motion of the entire structure. It is the intention to strengthen it by placing rip-rap on the outside in the near future. The government is preparing to extend the breakwater three miles eastward, which will give a basin 5 miles long. This will be dredged to give depth for the largest vessels, and Major Kingman predicted that as soon as this front was properly utilized for dockage, the iron business of the great lakes would again be centered at Cleveland.

W. J. Carter, city engineer of Cleveland, described some of the most interesting local municipal works. Cleveland has an area of 35 square miles and is divided about equally by the Cuyahoga River. Water supply is received through a 9-ft. tunnel, 4½ miles long, which was completed about a year ago. The new pumping station at the end of this tunnel has a daily capacity of 100,000,000 gal. There are two reservoirs, one holding 80,000,000 gal. and the other 35,000,000 gal. The city has 400 miles of water mains and about the same mileage of sewers. A large intercepting sewer is being built across the city, part of which is laid in a 42-ft. cut and the balance in tunnel built with steel shield. There are 600 miles of streets, of which 254 miles are paved, 91 miles with Medina stone, 18 asphalt, 183 brick. The brick used is 5-in. block, much of it being laid on sand foundation without any broken stone. The city has 1,500 acres of parks and 6 miles of boulevards. There is a proposition on hand to extend the boulevard system to entirely encircle the city. The Superior St. viaduct, of stone and iron, is 3211 ft. long, while the Central viaduct of steel is 3,838 ft. The bridges all cross the river and have swings, causing delays to shipping and to street traffic. Plans are being laid for two high level bridges. All of the latest smaller bridges are of the rolling lift type. The Columbus St. bridge has a double draw, while a new double rolling lift bridge is being erected on the same street. An immense amount of money is being put in the separation of grades and much work has already been accomplished in this direction.

Mr. Alexander Brown, of the Brown Hoisting Machinery Co., gave an interesting description of the company's plant and the growth of its business. He said that nearly all large manufacturing establishments originated in answer to local demands. Back in the seventies, the ore business of the lakes was centered largely at Cleveland. The facilities for handling ore were such that it was impossible to answer the demand and ore was shipped by rail from all parts of the country and from abroad. In those days vessels were unloaded by wheelbarrow. A little later donkey engines were rigged up and scoops used. In 1880 the first cableway unloading outfit was erected at Cleveland. It caused a riot among laboring men until it was demonstrated that laborers could make three or four times as much as they did before. From that day to this it has been a constant grind to produce sufficient ore-handling equipment to take care of the supplies of ore. He gave some very interesting figures on the production of ore in the lake region. Up to 1883 the ore received at all lake ports was about 1,000,000 tons. Five years later it had grown to 16,000,000 tons; five years later, 38,000,000 tons; five later, 46,000,000 tons, and the next five years, 100,000,000 tons. During the past two years 46,000,000 tons were produced and for five years back, including this year, the output was about 150,000,000 tons, as compared with 250,000,000 tons for 25 years back, including this year. This output would mean a pile 30 ft. high and 20 feet wide and 100 miles long, twice the excavating that will be required for the Panama Canal. In 1880 the largest ore carriers had a capacity of 900 tons. In 1885, the first thousand-ton iron vessels were built. To-day there are many vessels on the lakes having a capacity of 10,000 tons and quite a number having a capacity of 13,000 tons on 18½-ft. draft. Loaded as ocean vessels are loaded this would mean a capacity of 30,000 to 35,000 tons.

Mr. Brown spoke in not very complimentary tones of the methods of handling fuel and goods at ocean ports. He said that with about a dozen exceptions vessels were loaded and unloaded as they were 2,000 years ago; only they used more men and more stupidity. New York and Boston harbors, he said, were a disgrace to the country, practically no modern apparatus being used. At present, however, he saw a trend toward betterment of these conditions and he predicted that the next decade would see a great change in such methods. Incidentally he saw indications of a great revival in ship building, due to the remarkable example set by the lake ports.

In 1901, the plant of his company, which had been built up piecemeal, was entirely destroyed. At the time it was looked upon as a great calamity, but now they were glad it happened. The work of rebuilding was done thoroughly. Unlike many large manufacturing concerns, they did not move into the country and spread out. They do not believe in the theory of the economy of starting work at one end and working it through various departments, finally bringing it out the finished product at the other end. Instead they believe in the concentration of manufacturing processes. They aim to have the least possible handling and supervision. Their superintendent's office is in the center of the main building and at no time is he more than 300 ft. from any part. The plant was erected on the old site without securing additional ground, but they have three times the capacity that they had before. The main building is simply one large shed 500 ft. long by 312 ft. wide, entirely open, with cranes covering every inch of it. There are no obstructions and the building is designed for future extensions without any alterations. Every precaution was taken to make it fireproof. The entire framework is steel and the sides are all steel and concrete. On account of the heavy weight of the fireproof roofing common at that time, it would have been necessary to have used a much heavier framework than was desirable. Finally the company's engineers hit upon a combination of thin steel with a thin body of cement above and below. This is 1¼ in. thick and is laid on 5-ft. spans and it gives a working strength of 300 lb. per square ft. The sides were put up the same way and the plaster was applied without forms or supports. The company saved over $50,000 on the building, due to the lighter weight of structural material that it was enabled to use, as compared with other fireproof structures. This product, since known as ferroinclave, has become a prominent part of the company's product.

Dr. Howe, of the Case School of Applied Science, described some of the facilities of this well-known technical institution. It has departments for chemical, mining, civil, electrical and mechanical engineering, each department having its own separate building. The school has been liberally endowed and the trustees adopted the policy of putting a large percentage of the money into instruments and apparatus rather than buildings.

Mr. Harry Fuller, of the King Bridge Co., spoke briefly of his company's plant. It covers 20 acres and has a capacity of 30,000,000 tons. Its equipment is very modern.

In addition to the places of interest above enumerated, the members visited the main power station of the Cleveland Electric Ry., one of the largest direct-current power stations in the country. They were to have visited the plant of the Wellman-Seaver-Morgan Company, but owing to the sad deaths of Messrs. Wellman and Morgan, the officials of that company closed down their plant.

On Friday the guests enjoyed an all-day excursion by steamer to Lorain to see the works of the National Tube Co., the Lorain Steel Co., American Shipbuilding Co. and the terminals of the Baltimore & Ohio R. R.

TRADE PUBLICATIONS.

A catalogue of jet and surface condensers giving full information concerning details of construction, dimensions and capacities of several types of apparatus, has been issued by the W. H. Blake Steam Pump Co., Hyde Park, Mass.

A great variety of steam specialties are described in catalogue 8 of the Wm. Powell Co., Cincinnati. It is a well-indexed and illustrated book of 192 pages, describing and listing various valves, gates, checks, lubricators, oilers, bibbs, grease cups, water gauges, steam whistles, water and gas-works specialties, injectors and other apparatus too numerous to mention. The book also contains numerous tables and notes of value to the steam fitter.

A trade publication that merits the term sumptuous has been issued by the Wellman-Seaver-Morgan Co., of Cleveland, on the subject of coal and ore handling machinery. It gives excellent descriptions of the Hulett unloaders, conveyor bridges with excavating buckets, storage plants, traveling cranes, car-dumping machinery, locomotive cranes and revolving derricks, excavating buckets, stationary and traveling bins and other apparatus. The illustrations include views taken at many famous ports and steel plants.

The Lunkenheimer Co., Cincinnati, O., has published a booklet concerning its new generator valves for internal-combustion engines. They are not intended for inlet valves for four-cycle engines, but for use in place of check valves on the crank case of two-cycle engines.

An unusually concise and convincing statement of the merits of individual motors for driving machine tools is given in circular 13 of the Electro-Dynamic Co., Bayonne, N. J. While it dwells particularly on the special merits of the inter-pole motor in maintaining speed under fluctuating loads, running with sparking at the commutator, light weight and other features, it gives some useful data concerning the general subject of the electric drive. For example, there is a diagram showing the time required to perform the same kind of work on a 24-in. engine lathe with motor-drive, with a single-speed countershaft, and with a double-friction countershaft.

A new principle of water pumping is described in a catalogue received from the Deis Pump Co., Washington, D. C. A modification of the usual style of domestic pump is described for which remarkable claims are made for efficiency and effectiveness.

The Southern Corliss engine is illustrated in an attractive catalogue from the Southern Engine & Boiler Works, Jackson, Tenn. A distinctive feature of this engine is the enclosed inertia governor which is applied to the engine in a novel manner.

Hot water heating of buildings is discussed in a pamphlet from the Great Western Heater Co., Des Moines, Ia., builders of the Phillips hot water heater. Much useful information is also contained in the booklet in reference to hot water heating installation.

Record of Recent Construction, No. 49, of the Baldwin Locomotive Works, Philadelphia, Pa., is an especially interesting number, treating of the new Baldwin type of balanced compound locomotive. Recent locomotives built upon this system for the N. Y., N. H. & H., the A., T. & S. F. and the C., B. & Q. roads are described and the advantages of the balanced system in general are discussed.

Coal washeries are described in a new catalogue from Roberts & Schaefer Co., 1275 Old Colony Bldg., Chicago, consulting and contracting engineers for coal mining plants and coaling stations. The advantages of coal washing are discussed and numerous illustrations of installations for washeries and general mining purposes are given.

A beautifully illustrated book of value and interest to users of terne plate has been published under the title "From Underfoot to Overhead," by the American Sheet & Tin Plate Co., Frick Bldg., Pittsburg. It is a much more accurate description of the progress of a lump of ore from the Mesaba Hills to its place on the roof of a building than is given in some alleged scientific books, while the story is told with an interesting incisiveness that is unfortunately rare in technical articles.

The attention of contractors is called to the fact that a serial publication is issued by Willis Shaw, 171 La Salle St., Chicago, listing the second-hand engines, boilers, compressors, crushers, hoisting engines, pumps, drills, cableways, mixers, locomotives, cars, steam shovels, dredging buckets, derricks and other plant that he has on hand for immediate delivery. As this stock changes continually, contractors will find it desirable to be placed on the mailing list to which the bulletins are regularly mailed.

W. H. Anderson & Sons, 21-31 St. Aubin Ave., Detroit, Mich., have published three pamphlets useful to contractors. The first is a comprehensive priced catalogue of tools used in laying artificial stone or cement sidewalks. These tools are specially designed for the work and include a line of concrete mixers of many sizes. A second pamphlet describes a track wrench for setting the bolts of joints with great rapidity and firmness. A third catalogue describes many types of cold chisels and calking tools, and will prove particularly useful to those in charge of pipe laying and plumbing.

An interesting sketch of the development of biological methods of sewage disposal is given in a bulletin issued by Merritt & Co., 1022 Ridge Ave., Philadelphia. It also gives some notes concerning important installations on the various systems, compressing into eight pages a statement of the most important facts of the subject.

A. L. Ide & Sons, 11 Broadway, New York, have issued a little booklet discussing reliability, low cost of operation and low cost of maintenance in connection with high-speed engines. The points made are illustrated by reference to cuts of details of the company's engines.

The Wm. B. Scaife & Sons Co., 221 First Ave., Pittsburg, has issued a booklet of views of important water softening and purifying systems it has installed at industrial plants, blast furnaces, steel mills, paper mills, breweries and railway stations.

The United Concrete Machinery Co., 949 Broadway, New York, has just issued the most comprehensive catalogue of concrete mixers ever published by one company. These are the "United," a compact batch occupying a very small ground space and provided with an engine that tilts with the drum; the "Gilbreth," a rotary machine designed to secure the best possible mixing without regard to speed; the "Gotham," a very rapid mixer; the "cubical," both plain and end-feed; the "portable gravity," which is too well known to require description here; the "Stanley," a machine having a drum of octagonal cross-section which some people prefer to the cylindrical type; the "continuous trough," an old and reliable form which has many special advantages; the "Kershaw," a form much liked abroad; the "International," much like the last mentioned; the "Goodwin" and the "hand-power continuous," two very light machines for sidewalk and floor work; the "Midget," a small machine driven by a gasoline engine; the "steam-heated batch," a mixer specially designed for work in cold weather. The company also manufactures batch feeders and measurers, and acts as selling agents for Ransome twisted steel bars.

The growing use of gas and gasoline engines lends special interest to the new special catalogue of the Columbus Machine Co., Columbus, O., descriptive of its internal combustion engines. This company is furnishing, in addition to its standard stationary engines, portable engines for all purposes and also a traction engine for hauling as well as driving purposes.

Several hydro-electric power stations are described in an illustrated pamphlet by J. W. Rickey, 508 South First St., Minneapolis, Minn., in which special reference is made to the Rickey concrete-steel type of open penstock construction. The water power plants of the Lake Superior Power Co. at Sault Ste. Marie, the Hennepin Paper Co. at Little Falls, Minn., the Sterling Gas & Electric Co. at Sterling, Ill., and the Grand Rapids-Muskegon Water Power-Electric Co. at Muskegon, Mich., are described, in which the Rickey construction was used with marked economy.

The Water Works Equipment Co., 180 Broadway, New York, has issued a number of folders concerning supplies for water works. Among these may be mentioned packing of several brands, tube cleavers, pipe jointers, tapping machines, sleeves and valves for tapping machines.

The Cincinnati Electrical Tool Co., Cincinnati, O., has issued a pamphlet describing in much detail a portable electric drill which has a chuck capacity up to ½ in. The largest size of drill is made with two speeds. They can be furnished for either 110 or 220 volt circuits and are intended for any grade of work for which an ordinary breast drill is employed. The pamphlet also illustrates a portable grinding machine driven electrically, which can be tapped into any direct-current incandescent lamp circuit.

Chief draftsmen of offices where it is necessary to turn out a large number of tracings for blue printing will find it worth while to read a pamphlet issued by The Andrews Mfg. Co., 160 Garfield Place, Brooklyn, N. Y., on a new system of shading for tracings. A tracing is first prepared without any hatching or shading. Then a sheet of specially prepared vellum, with a raised surface to correspond with the desired hatching, is slipped under the tracing and the latter rubbed with a special pencil. This rubbing leaves the surface marked as desired, the remainder of the sheet being unaffected by the pencil. The marks adhere well, but if a large number of prints are to be made from the tracing the surface is painted with fixitive, like a crayon drawing. Changes in the shading are made readily. The vellum sheets are made to represent cast-iron, wrought-iron, steel, brass, babbitt, concrete, asphalt, granite, earth, gravel and brick. The system was developed for use in one of the largest drafting offices in the East, and has been so successful that it has been decided to handle it commercially.

The construction of catenary-suspension trolley lines for high-potential currents on single-phase railways is described in considerable detail in Circular 1,110 of the Westinghouse Electric & Machine Co. Illustrations of the high-tension lines thus equipped are shown and the details of the new line equipment which the company is now prepared to furnish are explained.

The new automatic block signals of the General Electric Co., Schenectady, the details of which were made public for the first time at the recent International Railway Congress, are described in its Bulletin 9,138. This system was developed by R. Herman and has been installed on the Pennsylvania lines west of Pittsburg. The various details of the equipment for all classes of signaling and under all conditions, are fully explained.

The Keller assay balance is described in a series of folders from the Salt Lake Hardware Co., Salt Lake City. It is made in a variety of patterns and received a gold medal at the Louisiana Purchase Exposition.

An attractive pamphlet has been issued by the Fort Wayne Electric Works, Fort Wayne, Ind., describing the desk, revolving and bracket types of fans it has adopted for this year. These are made for both direct current and alternating current, 60 and 140-cycle circuits of standard voltages. The leading details of construction and some of the general designs are illustrated, and some novel uses of the fans are pointed out.

FORMATION OF THE CANADIAN WHITE CO.

The announcement is made of the incorporation in Canada of the Canadian White Co., Ltd., to carry on a general contracting and engineering business on lines similar to J. G. White & Co., Inc., of New York, J. G. White & Co., Ltd., London, England, and the Waring-White Co., London, England. The letters patent of the incorporation were granted the latter part of May, and the organization of the company is now practically completed.

The Canadian White Co., Ltd., will undertake civil, mechanical, electrical, hydraulic and building work. It will be fully equipped to handle large construction contracts for steam or electric railways, and will be prepared to design, build, equip and operate electric lighting plants and power installations, gas works, water supply, sewerage systems, piers, docks, harbor works, office buildings, apartment houses, hotels, etc.

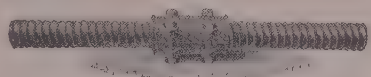
The contracting and engineering departments of J. G. White & Co., Inc., will at all times be at the service of the Canadian company, and the company will further have the benefit of the experience of the London companies mentioned above. This insures the Canadian company, from its inception, the benefits and advantages to be derived from a very long and successful experience in the contracting and engineering business.

The Canadian White Co., Ltd., has upon its board as stockholders, strong representative business men well known throughout Canada. The general manager of the company will be a prominent civil engineer with large experience in railway construction, etc., who has held executive positions. Mr. H. P. Douglas, formerly vice-president and general manager of the Canadian Otis Elevator Co., Ltd., is treasurer of the company. Mr. H. C. Hitch, secured as superintendent of building construction, has been for several years connected with the Thompson-Starrett Co., New York, as superintendent. Recently he has had full charge of the erection for the Thompson-Starrett Co. of the Union Bank Building at Winnipeg. This is one of the largest and most important buildings in Canada and the record made by Mr. Hitch in connection with this and previous work, insures the efficient handling of the building department. The company will make a feature of building construction, this work being carried out along the lines of the Waring-White Building Co., Ltd., of London, which has on hand at the present time contracts aggregating several millions of dollars.

The company has an authorized capital of $1,000,000, of which $500,000 is common stock and $500,000 is 6 per cent. cumulative preferred stock, preferred as to assets as well as dividends. After both kinds of stock have received dividends at the rate of 6 per cent. per annum, the preferred stock is entitled to share further with the common stock in any dividends declared up to a maximum of 10 per cent. per annum, above which the common stock is entitled to any residue.

CONTRACTOR'S FLEXIBLE ARMORED HOSE.

Attention has been already drawn in these pages to a flexible, steel-armored hose put on the market about a year ago. It was designed to resist destruction from falling materials, passing wagons and other causes, from bursting due to kinking, which is a frequent cause of leakage, and from failure through inability to resist occasional high interior pressures. The steel armor protects and strengthens the rubber lining so that even should the latter become damaged the hose can be kept in service until it is convenient to replace it with a new piece.


Armored Hose Coupling.

The ease with which splices can be made, either for the purpose of repairs or for coupling on new lengths, is rather surprising. A steel-enveloped rubber tube is not readily coupled in any ordinary way, yet the little clamps shown in the accompanying illustration enable the work to be done quickly. The construction and advantages of this hose are explained at length in Bulletin 5,058 of the Sprague Electric Co., New York.

BUSINESS NOTES.

Mr. John P. Dennison has resigned his position as western general sales agent of the New York-Continental-Jewell Filtration Co. to become general western manager of the filter department of the Norwood Engineering Co. His offices will be in the Hartford Bldg., Chicago.

The H. Mueller Mfg. Co., makers of water, gas and plumbing goods at Decatur, Ill., have opened an eastern office and warehouse at 254-258 Canal St., New York, under the charge of Mr. Oscar Mueller, treasurer of the company. The offices have been fitted up in an unusually elaborate manner, and one of the features is the noteworthy exhibit of the company at the Louisiana Purchase Exposition. The company will carry here a full line of pipe tapping machines, pressure regulators, brass water connections, lead goosenecks, curb and corporation cocks, service boxes, service clamps, strainers and pipe line tools for water works use; main tapping machines, cocks, meter connections and relief valves for gas works use, and a large variety of ground-key, compression and fuller work and tools for plumbing.

The Josephus Plenty Skylight Works, of Jersey City, has lately closed contracts for skylights for a North German Lloyd pier at Hoboken, the shipping building of the International Steam Pump Works at Harrison and a high-school at Jersey City. The company has just completed the skylights on Bldg. 17 at the League Island Navy Yard.

The sales of Westinghouse engines in Japan in 1903 and 1904 amounted to a total capacity of nearly 8,000 h.p. All of the 56 engines were of the vertical, single-acting type, and ranged from 12½ to 600 h.p. They were sold mainly to arsenals, railways, electric light companies, water work, hospitals and universities.

The U. S. Gypsum Co. has opened an office at 1135 Broadway, New York, under the management of G. Lester Williams for the sale and installation of plaster block products for partitions, wall furring and column covering.

C. W. Thomas has sold to the Roe-Stephens Mfg. Co., of which he is president, the plant and business of the Michigan Brass & Iron Works. Chas. A. G. Winter, for many years general superintendent of the Chapman Valve Mfg. Co., has accepted a similar position with the Roe-Stephens Mfg. Co.

Owing to the confusion caused by bearing the name of one city while located in another, the New Castle Bridge Co., of Indianapolis, has received permission to change its name to the Central States Bridge Co.

Crane Co., Chicago, Ill., announces that on or about June 24, 1905, their general offices and sales departments will occupy their new office building at 519 South Canal Street. A branch of the city sales department will be continued at the old address, 10 North Jefferson Street. The new offices will occupy five complete floors and will afford ample facilities for handling the company's rapidly growing business.

The T. A. Gillespie Co., 71 Broadway, New York, has contracts for making and laying 10,000 ft. of 72-in. riveted submerged pipe for the Erie (Pa.) waterworks, for making and laying 20,000 ft. of 43-in. and 48-in. lock-bar pipe for Wilmington, Del., for laying 70 miles of 16-in. and 18-in. riveted gas pipes in Kansas, for building a $400,000 concrete dam at Columbus, O., is at work on the $5,500,000 filter plant for Pittsburg with 6,000 tons of steel pipe and 250,000 yd. of concrete, and is finishing a number of smaller contracts in different parts of the country.

The George A. Fuller Co., Fuller Building, New York, has contracts for the erection of a number of very tall office and store buildings. Among them are the 20-story Boreel building and the 20-story addition to the new Trinity building, Broadway, the 15-story Cockroft building at John and Nassau Sts., and the reconstruction of the Plaza Hotel, which will be 12 stories high, besides two basements stories. In Chicago there is the 12-story Boston store, in Washington the 12-story Times building, in Boston the Siegel store and in Pittsburg the 17-story McChesney department store.

York Mfg. Co., York, Pa., manufacturer of ice-making and refrigerating machinery, reports the following orders: Five-ton refrigerating plant for the Majestic Apartment Bldg. Co., Dallas, Tex.; one 20-ton compression side and 5-ton freezing and distilling system to be installed in the U. S. Government Hospital for the Insane at Washington, D. C.; 20-ton compression side and direct expansion for the Phillipsburg (Pa.) Beef Co.; 5-ton refrigerating plant for the Maier & Zobelein Brewery, Los Angeles, Cal.; ammonia condensers and distilling system for 80-ton ice plant for the Home Ice Co., Houston, Tex.; 15-ton ice-making plant for W. D. Coggeshall & Co., Darlington, S. C.; 6-ton refrigerating plant for slaughter house of Mumma & Detweiler, Mt. Joy, Pa.; 30-ton ice plant for the Merchants Ice & Cold Storage Co., Los Angeles, Cal.; 15-ton ice plant for Aiken (S. C.) Artesian Ice Co.; 6-ton refrigerating and ice making plant for St. Joseph Home for the Aged, New York City; 10-ton refrigerating plant for the U. S. Horseradish Co., Saginaw, Mich.; 20-ton refrigerating plant for the Oliver Finnie Grocer Co., Memphis, Tenn.; 10-ton refrigerating plant for the White Hall (Ill.) Condensed Milk Co.; 10-ton compression side with 2-ton ice-making and refrigerating plant for experimental station, Department of Agriculture, Raleigh, N. C.; 60-ton refrigerating compression side, 10-ton freezing system and 150-h.p. boiler system for the Tuccon (Ariz.) Ice & Cold Storage Co.; 10-ton ice-making plant for Beach, Seaman & Gallagher, Long Beach, Cal.; 60-ton refrigerating compression side, for Palatka (Fla.) Ice Works; 60-ton compression side for Waygood, Ltd., Sydney, Australia; 15-ton freezing and distilling system for Pearman, Watlington & Co., Hamilton, Bermuda; 10-ton compression side for Agar, Cross & Co., Buenos Ayres, S. A.

The name of the Kinnear-Hood Steel Co. has been changed to the Kinnear Pressed Radiator Co., and the offices are now at 41 East 21st St., New York. The company announces that an increase of equipment at its Newark plant and the erection of a large factory at West Pittsburg, Pa., will enable it to make prompt deliveries of all orders hereafter.

The contract for power development on the Westfield River at Russell, for the Otis Fibre Board Co., has been awarded to the Ambursen Hydraulic Construction Co., Boston, the engineer for the owners being Chas. K. Stearns, of the same city. The dam will be a reinforced concrete structure 290 ft. long and 30 ft. high. The turbines will be furnished by the S. Morgan Smith Co.

The sales organization of the Westinghouse Machine Co. has been largely extended, and in addition to the former offices at New York, Boston, Pittsburg and Chicago, new branches have been established at Cincinnati, Denver, San Francisco, Charlotte and Atlanta.

The Steam Boiler Equipment Co. has removed its offices to 123 Liberty St., New York.

The Pacific Flush Tank Co., makers of siphonic apparatus of every description for operating bacteria beds or intermittent flush tanks, have moved their offices to The Temple, 184 La Salle St., Chicago.

The Railway Electric Power Co. has recently been incorporated to introduce the Ganz alternating-current traction systems in this country. The directors of the new company are John E. Borne, president of the Colonial Trust Company; William L. Bull of Edward Sweet & Co.; Henry Seligman of J. & W. Seligman, H. R. Duval, Stephen Peabody, Leopold Wallach of Wallach & Cook, Henry L. Sprague of Stetson, Jennings & Russell; Gustav Lindenthal, ex-Commissioner of Bridges, and Gustav Leve. L. B. Stillwell, electrical director of the Interborough system, and Frank N. Waterman are the consulting engineers of the company, which has acquired all the Ganz patents for the United States, Mexico, Cuba, and such of the West Indies as are not under British supremacy.

The United States Steel Piling Co., 135 Adams Street, Chicago, reports the sale of 11,000 sq. ft. in 22-ft. lengths for the Belle Fourche, So. Dak., irrigation project of the U. S. Government; 5,600 sq. ft. in 16-ft. lengths to the water department of Los Angeles, Cal.; 3,000 sq. ft. in 5, 7, 12, 17 and 30-ft. lengths for circular caissons for the foundations and for retaining walls for the new Brevoort Hotel, Chicago; 1,800 sq. ft. in. 14-ft. lengths for foundation work for the annex to the New York Tribune Bldg.; 2,000 sq. ft. in. 20-ft. lengths, for cofferdams of a bridge over the Tuscarawa River and Ohio Canal at Canal Dover; 2,500 sq. ft. in 16-ft. lengths for bridge work on the Norfolk & Western Ry. in Ohio; 1,700 sq. ft. for bridge work on the Wabash R. R. in Michigan; an order to the Lehigh & Wilkesbarre Coal Co., Wilkesbarre, Pa., for lining a deep well; and another to the Big Muddy Coal & Iron Co., Murphysboro, Ill., for coal mine shafts. All of the steel piling for the above orders has already been shipped from the Homestead Works of the Carnegie Steel Co.

The P. J. Carlin Construction Co., 1 Madison Ave., New York, has recently taken contracts in New York and vicinity for a $300,000 group of buildings for the Long Island R. R., a $100,000 sub-station of the New York Edison Co., a reinforced concrete approach to the Brooklyn Institute, a 10-story office building which will cost $200,000 exclusive of the grillage foundations, the St. Patrick's cathedral mortuary chapel at about $200,000, the reconstruction of the 59th St. Riding Academy costing $200,000, the Stuyvesant high school, and the Broome St. school costing together about $1,000,000, and a number of additions to private houses.

The Bethlehem Steel Co. is now working on three 86,600-lb. crank shafts, each made from a 25x4x4-ft. ingot. They are intended for the three Snow gas engines which will drive 4,000-kw. Crocker-Wheeler alternators in a reserve power plant of the California Gas & Electric Co.

The Cyclone Drilling Machine Co., Orrville, O., has just completed the largest month's business in its career. The sales of prospecting drills, blasting drills, placer prospecting outfits and blast-hole loaders has extended to Alaska, Canada and Mexico. The rapidity with which the economy blast-hole loader is gaining favor has been surprising. The company's factory is running full time with a full force, and the outlook for future business is most encouraging.

The Vulcan Iron Works Co., Toledo, O., has shipped one of its "Little Giant" steam shovels to the Northern Mines, Ltd., of Atlin, B. C., where it will be used in placer work. Rochussen & Collis, of Victoria, B. C., handled the sale.

The Godwin Construction Co., engineer of Erie Basin, has opened an office at 60 Wall St., New York, for the purpose of carrying on the business of contracting, making a specialty of foundations and concrete work and harbor improvements. Phil. H. Godwin, C. E., for several years superintendent in charge of Erie Basin, is president of the company; Dr. Myron S. Falk, of Columbia University, has been retained as the company's engineer.

The Miller-Collins Co., 1133 Broadway, New York, has been awarded the contract for the structural steelwork of the building for the Gorham Mfg. Co., at 384 Fifth Ave., New York. McKim, Mead & White, Archts., C. T. Wills, general contractor.

Messrs. B. Franklin Hart, Jr., & Co., 143 Liberty St., New York, were the general contractors for the high-pressure water system at Coney Island, described in this journal on May 20.

An important event in the machinery trade was the recent incorporation of Manning, Maxwell & Moore, Inc., composed of Manning, Maxwell & Moore and its allied companies, the Shaw Electric Crane Co., the Ashcroft Mfg. Co., the Consolidated Safety Valve Co., the Hayden & Derby Mfg. Co., the Hancock Inspirator Co., and the United Injector Co. The corporation was formed under the laws of New Jersey, with a paid-up capital of $5,000,000, all in common, non-assessable stock. The officers are: Charles A. Moore, president; John N. Derby, vice-president; Martin Luscomb, vice-president; Stephen B. Aller, vice-president; Colby M. Chester, Jr., treasurer; J. H. Blue, assistant treasurer; Charles Arthur Moore Jr., secretary, and Merle S. Clayton, assistant secretary. There is to be a board of fifteen directors, among whom are some very prominent New York business men. Business will be carried on at the home office of Manning, Maxwell & Moore, at 85, 87 and 89 Liberty St., New York, and through their branch offices in Boston, Philadelphia, Chicago, Cleveland, Pittsburg and St. Louis.

The New Castle Portland Cement Co., New Castle, Pa., has placed an order with the Allis-Chalmers Co. for four rotary kilns, each 100 ft. in length and 7½ ft. in diameter at the large, and 6½ ft. at the small end. These kilns are of extra heavy design throughout. The tendency of late in the cement business has been to lengthen the kilns. A few years ago kilns measuring 60 ft. were practically the standard, but kilns which are now being erected range from 80 to 125 ft., 100 ft. being about the average. In addition to the kilns, the Allis-Chalmers Co. will furnish a crushing plant consisting of one No. 6 K Gates rock breaker, two No. 4 Gates breakers and one No. 6 elevator. The No. 6 breaker receives the limestone as it comes from the quarry and does the preliminary crushing. The discharged product is divided and sent to the two No. 4 breakers, which prepare it for the grinding.

J. G. White & Co., New York, whose completion of the Manila electric railway was mentioned a few weeks ago, have other contracts amounting to about $1,000,000 for harbor improvements at Cebu and Iloilo. The work is so remote that extensive machine shops had to be established to build and maintain the dredges. Among the company's contracts in the United States an important one is the installation of a 26-mile electric line between Alton and East St. Louis, which includes the reconstruction of a power house at Alton, the construction of two sub-stations and three long overhead structures crossing steam railroads, at a cost of about $1,000,000. The $500,000 contract for the construction of the Rochester & Lyons road is well under way, and includes 35 miles of double track, together with overhead construction, grading between Palmyra and Lyons and laying 60,000 sq. yds. of vitrified brick paving; the rebuilding of the electric light and power plant at Wilkes-Barre, Pa., involves the installation of 1500 kw. turbo-generators, the building of a pipe line across the Susquehanna River and changing the system from direct to alternating current, the whole costing about $333,000. Other important contracts under way include the building of a ten-mile electric railroad between Edwardsville and Mitchell, Ill., the erection of a turbine-driven power plant of 1,200 kw. capacity at Rutland, Vt., with two sub-stations in Rutland and one in Castleton about eight miles distant. At Sayre, Pa., an extensive water system, comprising reservoir, pipe line, wet well and pump pit, is being built for the Lehigh Valley R. R. The construction of an 18-mile electric railroad between Worcester and Leominster, Mass., has also just been commenced by the company.

The first single-phase equipment for a Canadian electric railway has been ordered from the Canadian Westinghouse Co., Ltd. It will consist of 300-kw., 3,300-volt, single-phase engine-type generators, direct-connected to Robb-Armstrong engines, with two 50-h.p. single-phase motors on each car. The Canadian Westinghouse Co. has recently closed contracts for car equipments for the Chatham, Wallaceburg & Lake Erie Ry., and for two 6,400-kw. generators and four 3,200-kw. transformers for the Hamilton Cataract Power, Light & Traction Co.

The Baltimore Bridge Co. is erecting for the Thos. C. Basshor Co., Baltimore, Md., a 200x90-ft. boiler shop of steel construction. A 20-ton electric crane has been installed, and all the machinery will be driven by electric motors.

The Kennicott Water Softener Co., Railway Exchange, Chicago, Ill., is erecting a new factory at Chicago Heigths, which it expects to have completed within 60 days. The plant will include a 300x80-ft. tank and structural shop, a 35x80-ft. machine shop, an office building 40 ft. square and a power house.

Among recent orders taken by the Allis-Chalmers Co. are the following: A complete sampling-mill equipment with electrically operated converter and two reverberatory furnaces for the Arizona Smelting Co.; a 50-ton copper smelting plant for a Chilian mining company. a large blast furnace for copper ores for the Tacoma Smelting Co.; for Reynolds-Corliss engines for running nine fans at the colleries of the Delaware & Hudson Coal Co.; a 340-h.p. vertical cross-compound Reyonlds-Corliss engine for the Champion Copper Co.; a 5,000-h.p. vertical cross-compound Reynolds-Corliss engine for the Twin City Rapid Transit Co.; two horizontal Reliance engines and a Bullock alternator for the Florida East Coast Ry.

The Exeter Machine Works, New York, has lately closed contracts for complete coal and ash handling plants for the Hudson River Electric Power Co., Utica, N. Y.; United Electric Light Co., Springfield, Mass., and the Tennessee Copper Co., Copperhill, Tenn. These installations include the Le Grand patent pivoted bucket conveyor, belt conveyors and new designs of suspended flight conveyors.

PERSONAL NOTES.

Mr. John F. Skinner has been appointed principal assistant city engineer of Rochester, N. Y.

Mr. Eli Coulter, formerly County Surveyor of Jefferson County, Pa., and for many years City Surveyor of Punxsutawny, Pa., died June 25.

Mr. John S. Green, of Saginaw, Mich., died recently in Spokane, Wash., where he was engaged in engineering work.

Capt. Robert P. Johnston, Corps of Engineers, U. S. A., has been transferred from Washington Barricks to the office of the chief of engineers.

Mr. J. L. Campbell has been appointed engineer of maintenance of way of the El Paso & Southwestern and El Paso & Northeastern lines.

Mr. F. P. Stearns, chief engineer of Metropolitan Water and Sewerage Board of Boston, Mass, has received the degree of master of arts from Harvard University.

The title of Mr. J. W. Eber, assistant to the engineer of maintenance of way of the New York Central R. R. at New York, has been changed to engineer of tracks.

Prof. James M. Caird, of Troy, N. Y., has ben retained by the Charleston, S. C., Light & Water Co., to make a chemical and bacterial investigation of the water supply.

Messrs. John W. Hill and Henry C. Hill have opened an office in the Fidelity Bldg., Philadelphia, Pa., as consulting engineers and experts for works of public water supply and other public utilities.

Mr. Rhoades Fisher, Jr., has completed the survey and design of a water works system for Camagüy, Cuba, and has been appointed on the staff of the Juragua Mining Co., at Firmeza, Cuba.

Lieut.-Col. Richard L. Hoxie, Corps of Engineers, U. S. A., has been assigned to the Fifth Lighthouse District to relieve Col. William A. Jones, Corps of Engineers, U. S. A., who has been retired.

Capt. T. R. Maul, superintendent of construction in the U. S. Treasury Dept., has completed the construction of a post-office building at Torrington, Conn., and been assigned to duty on a similar building at Rock Hill, S. C.

Mr. C. E. Griffith, an engineer in charge of the construction of a cold storage and electrical power plant which the Isthmian Canal Commission is building in Panama, died recently of yellow fever in Panama.

Mr. Paul S. Craig has been appointed an engineering aid on the staff of the U. S. Reclamation Service, at Cody, Wyo. He is a graduate of the Western University of Pennsylvania and has had considerable experience on railway and government works.

Prof. Olin H. Landreth, professor of engineering at Union University and consulting engineer of the New York State Board of Health, has received the degree of doctor of science from Union University, Schenectady, N. Y.

Mr. E. C. Woodward has been appointed an engineering aid on the staff of Mr. J. E. Field, U. S. Reclamation Survey, in Wyoming and Nebraska. He is a graduate of New York University, with extensive experience in railway work in the West.

Mr. J. W. G. Walker, civil engineer in the Navy Department, has been transferred from the naval station at Charleston, S. C., to the navy yard at Norfolk, Va. Mr. Walker has been supervising the construction of the new dry dock at Charleston.

The Baltimore Sewerage Commission has been organized with General Peter Leary, Jr., as chairman. Messrs. Rudolph Hering, Samuel M. Gray and F. P. Stearns have been retained to make a general investigation of the problem of sewerage in the city.

The following officers were elected at recent organization of the Appalachian Engineering Association, at Williamson, W. Va.; Messrs. F. W. Calloway, president; Joseph F. Kent, vice-president; Dr. Henry M. Payne, secretary; Mr. N. H. Mannakee, treasurer.

Mr. Alan D'Heur has been appointed district engineer of maintenance of way of the Southern Pacific Co. at Los Angeles, and Mr. W. C. Eads to a similar position at San Francisco. Mr. H. B. Titcomb has been appointed resident engineer at Bakersfield.

Mr. C. M. Buck has been appointed office engineer of the Atchison, Topeka & Santa Fe Ry., and will be succeeded as assistant engineer at Marceline, Mo., by Mr. H. W. Wagner. Mr. W. S. Hughes has been appointed assistant engineer at Arkansas City, Kan.

Mr. George H. Pegram has been appointed chief engineer of the Rapid Transit Subway Construction Co., of New York City, succeeding Mr. S. L. F. Deyo, who has resigned. Mr. Pegram also succeeds Mr. Deyo as chief engineer of the Interborough Rapid Transit Co., of New York City.

Mr. George H. Webb, who has recently become chief engineer of the Michigan Central R. R., has appointed Mr. Raymond D. Starbuck, assistant chief engineer, the position vacated by Mr. Webb. Mr. George H. Harris succeeds Mr. Starbuck as division engineer of the western division of the Michigan Central.

Mr. Niven McConnell, general superintendent of the Donora works of the Carnegie Steel Co., has become vice-president and general manager of the Passaic Steel Co., of Paterson, N. J. Mr. McConnell had charge of the construction of the Sharon and the Donora works and one of the open hearth departments of the Homestead works of the Carnegie Steel Co.

Mr. Franklin H. Davis, superintendent of the Midvale Steel Co., of Philadelphia, Pa., died suddenly in Great Barrington, Mass., June 23. Mr. Davis was a graduate of Massachusetts Institute of Technology and entered the employ of the Midvale Steel Co. after his graduation, advancing steadily until he became superintendent of the works five years ago.

Col. Edwin A. Stevens, Prof. Palmer C. Ricketts, president of Rensselaer Polytechnic Institute, and Capt. David W. Taylor, naval constructor, U. S. N., have received the degree of doctor of engineering from Stevens Institute, Hoboken, N. J. Forty-eight students received the degree of mechanical engineer at the recent commencement of that institution.

Mr. Francis J. Seery has been appointed assistant engineer on the New York State barge canal and assigned to the western division. Mr. Seery recently graduated from Tufts College and has had experience in the U. S. Geological Survey, the exploration survey made by the Isthmian Canal Commission in 1900 and in the city engineer's office at Waterbury, Conn.

Mr. George E. Macklin, general manager of the Pressed Steel Car Co., and also general manager of the Pennsylvania Car Wheel Co., both of Pittsburg, Pa., died June 26, in Philadelphia, Pa. Mr. Macklin graduated from the Rensselaer Polytechnic Institute and was connected for a time with the Colorado Fuel & Iron Co. Later he was employed by the Simplex Railway Appliance Co. He entered the service of the Pressed Steel Car Co. in 1899 and was for some time in charge of that company's business in New York City.

The Panama Canal consulting engineers have been requested by the President to meet on September 1 to consider the various plans for the canal. The members are invited to visit the Isthmus if they wish and to submit minority reports if unable to agree. The board consists of Gen. Geo. W. Davis, Alfred Noble, Wm. Barclay Parsons Wm. H. Burr, Gen. Henry L. Abbott, F. P. Stearns, Joseph Ripley, Isham Randolph, Herman Schussler, of the United States; W. H. Hunter, of Great Britain; Eugene Tincauser, of Germany; M. Guerard, of France; M. Quellennec, of the Suez Canal Co. and a Dutch engineer not yet nominated.

Mr. Hampton Reynolds has been appointed assistant engineer of the Public Belt Commission of New Orleans. Mr. J. Z. Hardee has been appointed first field engineer in the engineering department of that city and Mr. R. T. Bond, second field engineer in the same department.

Capt. William D. Conner, Corps of Engineers, U. S. A., has been assigned to the Sixteenth Lighthouse District to relieve Capt. Eugene W. Van C. Lucas, Corps of Engineers, U. S. A., who has resigned to accept a position as engineer in charge of an industrial plant in Wilmington, N. C., as was recently noted in this journal. The resignational of Capt. Lucas takes effect Jan. 1, 1906.

Mr. George T. Barnsley, resident engineer in charge of construction of the Wabash-Pittsburgh Terminal R. R., has been appointed chief engineer of the Wabash lines east of Toledo, succeeding Mr. James W. Patterson, chief engineer of the Wabash-Pittsburg Terminal R. R., and in part Mr. W. S. Newhall, chief engineer of the Wabash R. R. Mr. Barnsley entered the service of the Wabash R. R. in 1901 on the Pittsburg terminal construction and has been continuously employed on that work since. Before his connection with the Wabash R. R. he was in the engineering department of the Pennsylvania R. R., and prior to that in the engineering department of the Norfolk & Western R. R.

Mr. Wallace C. Johnson, commissioner of river improvements of New York State, has received the degree of master of arts from Williams College, Williamstown, Mass. Mr. Johnson is also chief engineer of the Shawinigan Water & Power Co., of Montreal, Canada, and consulting engineer for the Niagara Falls Hydraulic Power & Mfg. Co., Niagara Falls, N. Y.

Mr. E. T. Jeffery, president of the Denver & Rio Grande R. R., has been elected president of the Western Pacific R. R. to succeed Mr. W. J. Barnett, who has resigned. Mr. Virgil G. Bogue has been elected vice-president and chief engineer of the Western Pacific R. R., and Mr. Barnett has been elected vice-president and general counsel.

Mr. Harold U. Wallace, chief engineer of the Illinois Central R. R., has resigned to become third vice-president of J. G. White & Co., Inc., of New York City. Mr. Wallace took a special course in civil engineering in Purdue University after graduating from the Chicago Manual Training School. He entered the service of the Illinois Central R. R. in 1894 as assistant engineer in charge of construction and of new concrete and masonry work, remaining in that position until 1896, when he was appointed resident engineer of the lake front improvement work at Chicago. This work included the depression and reconstruction of 20 miles of main line and yard track, a masonry retaining wall one mile long, 8,000 ft. of sea wall, 2,000,000 cu. yd. of filling, an underground station and 3 street viaducts; it was finished in 8 months. From 1896 to 1900 Mr. Wallace was roadmaster of the Chicago terminals and of the Louisville division of the Illinois Central R. R., the main line of the Louisville division being entirely reconstructed under his direction. He was appointed superintendent of the Freeport & Louisville division in 1900 and in 1902 became chief engineer of the Illinois Central.

CONTRACTING NEWS

OF SPECIAL INTEREST TO CONTRACTORS, BUILDERS, ENGINEERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES.

WATER.

Notes Arranged Alphabetically by States.

**Montgomery, Ala.*—The Hartley Boiler Wks., of Montgomery, is stated to have secured the contract on June 23 for the new standpipe for the water works extension, for $15,698.

Phoenix, Ariz.—Mayor Adams has appointed a commission consisting of S. Oberfelder, Geo. H. N. Luhrs, Chas. E. De Mund, Vernon L. Clark and F. M. Magnett, to have charge of the construction of municipal water works, for which the city about one year ago voted bonds to the amount of $300,000. The bonds have not yet been sold.

Yuma, Ariz.—Plans and specifications are on file at the office of The Engineering Record, 114 Liberty St., New York, N. Y., for the construction of about 12 miles of dike, bids for which are to be opened Aug. 17, as advertised in The Engineering Record.

**Yuma, Ariz.*—Homer Hamlin, Dist. Engr., U. S. Reclamation Service, Yuma, writes that the contract for constructing Laguna dam and sluiceway (Bids opened June 5) has been awarded to J. G. White & Co., 43 Exchange Place, New York, N. Y., for $797,650. For list of bids received for this work, see issue of The Engineering Record June 17.

Red Bluff, Cal.—F. W. Decker, Town Clk., writes that an election will probably be held to vote on issuing bonds for water works, as soon as estimates are completed.

Ventura, Cal.—See "Power Plants, Gas and Electricity."

Fresno, Cal.—The Fresno Canal & Irrigation Co. is stated to have decided to construct new headworks on its main canal on King's River to be of concrete and iron; cost about $25,000.

Whittier, Cal.—New bids will be received July 12 for pipe and machinery to pump 4,000,000 gal. per day. E. C. Butterfield, City Clk., Frank H. Olmsted, Consulting Engr., Los Angeles.

The following are the bids opened June 12 for a 600-ft. well 12 in. in diam.: Pacific Drilling Co., $1,200; W. W. Wright, Whittier, Cal., $1,500; C. C. Lupp, Whittier, $1,357; E. C. Proctor, Los Angeles, $1,200; A. J. Bramlette, Downey, $1,312.

Longmont, Colo.—W. L. McCaslin, Secy, Blue Mountain Reservoir & Ditch Co., writes that it is proposed to construct 10 miles of ditch, 4,000 ft. of dam, etc., at a cost of about $200,000. J. M. Ferguson is engineer.

**Wilmington, Del.*—The Edge Moor Iron Co. is reported to have secured the contract for two 300-h.p. water tube boilers (bids opened June 16) for $8,770 with heater.

Monroe, Ga.—T. C. Blasingann, City Clk., writes that it was voted June 21 to issue $30,000 bonds for the construction of water works.

Chicago, Ill.—The City Council has referred to the Finance Com. the ordinance that when it reports on the high pressure water ordinance before it to provide for a system that will not only furnish high pressure water for fire protection, but make it practicable to furnish power.

Alton, Ill.—Local press reports state that at a conference of the Municipal Ownership Comn. with W. A. Underwood representing the owners of the Alton waterworks, the latter stated that the owners would sell plant to city for about $245,000, including claim now held against city by water company. He also made a proposition to city regarding an extension of contract for 25 years, in which he proposes that the city install 190 fire hydrants at an annual rental of $50 each, in consideration of which the water company will double its pumping capacity, extend its mains to all parts of the city, build a 4,000,000-gal. reservoir, double the capacity of the filtration plant and establish an auxiliary pumping station.

Marion, Ind.—The Bd. of Pub. Wks. is reported to be looking for a location for a reservoir, to hold about 1,500,000 gal.

Princeton, Ky.—Bids will be received by the City Council July 3 for the purchase of $35,000 bonds, to be used for the construction of water works. The wells are partially completed and Granbery, Jackson, of Nashville, Tenn., is preparing detailed plans and specifications for the entire plant. Bids will probably be called for in August.

Donaldsville, La.—E. A. Thibodeaux, of Donaldsville, will be engineer in charge of the proposed water works improvements, recently voted for by the citizens.

**Vidalia, La.*—Contracts for constructing water works (bids opened June 20) are stated to have been awarded as follows: Water tower, complete, to the Chicago Bridge & Iron Wks.; piping, to E. A. Hammond, Dallas, Tex.; pumps and electrical machinery, to Platt Iron Works, Dayton, O., and valves and hydrants, to the Fairbanks Co., of New Orleans.

McDonoghville, La.—See "Power Plants, Gas and Electricity."

Dracut, Mass.—Chas. L. Hodge, Nicholas Gallagher and Stephen R. Kitchen have been selected as Water Comrs. and, according to press reports, they will have charge of installing new water service in Dracut.

Uxbridge, Mass.—The citizens are reported to have voted June 24 to extend the water works, at a cost of $75,000.

Kalamazoo, Mich.—E. H. Barnes, of Grand Rapids, Resident Engr. Grand Rapids & Indiana Ry. Co., writes that this company does not intend to construct water works at Kalamazoo as previously reported; it is simply considering the erection of a railroad tank for engines.

Duluth, Minn.—The Water & Light Com. of Duluth will shortly ask for bids for constructing a 10,000,000 gal. reservoir, in West Duluth, and following is an estimate of quantities and material required: 54,000 cu. yds. earth excav., 150 cu. yds. rock excav., 2,000 cu. yds. Portland concrete, 6-in. thick, 750 cu. yds. crushed rock, 3,300 sq. yds. 6-in. sandstone pavement, 3,000 cu. yds. puddle, 1,164 lin. ft. coping, 600 lin. ft. rough stone gutter, 1 valve chamber and 60 cu. yds. gravel in roadway.

It is reported that bids will be received by the Light and Water Comn. until 4 P. M. July 6 for the construction of a 10,000,000-gal. reservoir, and the extension of 22,950 ft. of 4 and 6-in. water mains and about 19,950 ft. of gas mains.

Crookston, Minn.—The Crookston Water, Power & Light Co. is reported to have decided to sink an artesian well.

**Lamberton, Minn.*—Geo. J. Grimm, Village Recorder, writes that J. F. Johnson. of Gibbon, has secured the contract for constructing water works (bids opened June 19) for $3,150.

Handsboro, Miss.—A company is reported to have been organized here, with L. J. Leger, as president, and with a capital of $5,000, to construct water works. About 4 miles of pipe will be laid.

Jackson, Mo.—It is stated that bids are wanted until Aug. 1 for constructing a municipal water works system; probable cost, $27,000. Edw. D. Hays, Mayor; Hiram Phillips, Engr., 615 Frisco Bldg., St. Louis, Mo.

Alma, Neb.—See "Power Plants, Gas and Electricity."

Lovelocks, Nev.—The question of constructing water works is reported under consideration here.

Newark, N. J.—The Water Com. of the Bd. of Wks. is reported to be considering a plan for increasing the pressure of the water supply in the central part of the city. It involves the construction of a 36-in. main from Belleville reservoir to Clinton Ave. along High St. and the abandonment of Clifton Ave. reservoir for anything but a storage and emergency basin; probable cost of work, $200,000.

**Camden, N. J.*—The contract for meters is stated to have been awarded to the Pittsburg Water Meter Co.; the Camden Iron Wks. is reported to have secured the contract for pipe and fire hydrants.

New York, N. Y.—Bids will be received until July 12 by John T. Oakley, Comr. Water Supply, Gas and Electricity, for furnishing, delivering and laying water mains in portions of numerous streets; also for hauling and laying water mains in 12 streets, Boros. Manhattan and Bronx.

New York, N. Y.—The Bd. of Estimate on June 23 authorized an issue of $5,640,000 bonds for improvements in the water service in Manhattan, Bronx, Queens and Brooklyn Boroughs.

Troy, N. Y.—Bids will be received until July 7 by Wm. H. Gearin, City Comp., for $310,522 additional water works bonds.

Newburg, N. Y.—It is stated that it is proposed to construct a brick addition to the pumping station and install a new boiler, lay a main about 2,000 ft. in length in Powell Ave. and insert pipes and connections at the Monell reservoir at Washington Lake, so this supply will become available if necessary.

**Ft. Michie, N. Y.*—Capt. E. F. Ladd, Q.-M., U. S. A., New London, Conn,, writes that the contract for constructing water works at Ft. Michie (bids opened June 15) has been awarded to the Acme Water Construction Co., Park Row Blidg, New York, N. Y., for $32,060.

Sandy Hill, N. Y.—Village Engr. Jas. McCarthy, in his report on the water supply furnished by the Spring Brook Water Co., is stated to have recommended an expenditure of about $8,000 for improvements.

**Ft. Wood, N. Y. H., N. Y.*—Capt. Traber Norman, Q M., U. S. A, Governor's Island, writes that the contract for laying c i. main and submarine water main for water system at Ft. Wood (bids opened June 15) has been awarded to The Abbot-Gamble Co., of 32 Bway., N. Y. City, for $25,900.

Medina, N. Y.—The Bd. of Aldermen is reported to have purchased the plant of the Medina Water Co., at a cost of $70,000, and will expend $30,000 in improvements.

Brooklyn, N. Y.—Bids will be received until July 19 (not July 29, as previously stated) by John T. Oakley, Comr. Water Supply, Gas and Electricity, N. Y. City, for furnishing and installing electrically driven pumps, with all appliances complete, for high-pressure fire service, three in pumping station to be erected at Willoughby and St. Edwards Sts. and five in pumping station Furman and Joralemon Sts.; also July 5 for furnishing c. i. pipe and special castings, all in Boro. Brooklyn.

Fostoria, O.—The State Bd. of Health has approved plans for a slow sand filtration plant for Fostoria.

Arcanum, O.—See "Power Plants, Gas and Electricity."

**Columbus, O.*—Westwater & Casey, of Columbus, have secured the contract for the construction of purification works (bids opened by Bd. of Pub. Service June 15) for $524,209. For detailed list of bids received for this work see issue of The Engineering Record June 24.

Cleveland Heights, O.—Bids will be received until July 25 by Wm. G. Phare, Village Clk., 402 Am. Trust Bdg., Clveland, for furnshing materials and laying water pipe in portions of 16 streets; separate bids must be submitted on each street.

Portland, Ore.—The Water Bd. is reported to have on June 15 ordered the laying of water mains on 2d St. and in the manufacturing district of North Portland, at a cost of about $26,000.

**Items marked thus give the names of parties awarded contracts.*

Jamestown, Pa.—An election will be held in July to vote on issuing $22,000 bonds for water works. Engineer, G. B. Zahniser, New Castle.

Ephrata, Pa.—The Bd. of Arbitrators fix the value of the plant of the Ephrata Water Co., including equipment, etc., at $47,200. The town is reported to be considering the purchase of the plant.

Slatington, Pa.—Bids will be received until July 11 by the Washington Water Supply Co. (Ira Seidle, Secy.) for constructing a system of water works, to embrace approximately 27,300 ft. 12 and 4-in. pipe, 10 double-nozzle fire hydrants, 20 12 and 4-in. valves and boxes, and a 1,300,000-gal. reservoir. Warren F. Cressman, Engr., Sellersville.

Columbia, S. C.—Bids are wanted Aug. 8 for furnishing material and constructing water works, as advertised in The Engineering Record.

Ft. Pierre, S. D.—Bids will probably be received about July 20 for the construction of water works. Plans, etc., on file after July 7. Engineer, M. A. Earl, First Natl. Bank Bldg., Chicago, Ill.

Highmore, S. D.—There is reported to be talk of constructing water works here.

**Dallas, Tex.*—J. M. Bassett, Ch. Engr. water wks., writes that the contract for constructing a wooden conduit (bids opened June 10) has been awarded to The Excelsior Wooden Pipe Co., San Francisco, Cal., at $2.46 per ft. This is 42-in. pipe and does not include trenching, back filling or hauling; length about 3,400 ft.

**Northfield, Vt.*—Chas. A. Edgarton, Secy. Water Comrs., writes that contracts for water works (bids opened June 6) have been awarded as follows: To Flood & Sherrill, of Sandy Hill, for reservoir and laying pipe; to M. J. Drummond & Co., of New York, N. Y., for the pipe, and to the Rensselaer Mfg. Co., of Troy, N. Y., for hydrants and valves. Total cost about $12,000.

**Bristol, Vt.*—Engineers Lhoyd & Mann, Concord, N. H., writes that the contract for constructing a gravity system of water works (Bids opened June 2) has been awarded to Denniston & Co., of Rochester, N. Y., for $51,172.

Leesburg, Va.—The election held last spring to vote on issuing $30,000 bonds for water works is reported to have been illegal and another election will probably soon be held.

**Norfolk, Va.*—The following are reported to be the bids opened June 24 by the Jamestown Exposition Co. for the surface and ground water drainage, sewer and water supply for the Jamestown Exposition Co. on its property at Sewells Point: Hanley-Casey Co., Norfolk, $26,835 (awarded contract); J. M. Sargent, Richmond, $52,604; Guild & Co., Chattanooga, Tenn., $49,958; C. L. Patterson & Co., Macon, Ga., $46,133; Southern Con. Co., Norfolk, $39,201; W. G. Monis, Phoebus, $69,485, and J. A. Vandegrift, Newport News, $40,556.

Kennewick, Wash.—See "Power Plants, Gas and Electricity."

Seattle, Wash.—The City Council has passed an ordinace providing for the laying of water mains on N. 76th and other streets, at a cost of $11,450; and on Lane and other streets, $26,200.

Manitowoc, Wis.—The Council is reported to have adopted a resolution authorizing the city surveyor to prepare plans, specifications and estimates of cost of municipal water works, to be in operation Nov. 1908.

Guantanamo, Cuba.—The following are the bids opened June 24 by the Bureau of Yards & Docks, Navy Dept., Washingon, D. C., for reservoir and water system for naval station at Guantanamo; (*a*) for reservoir and water system complete; (*b*) amount to be deducted if material to be furnished by contractor for installation by Government be omitted; (*c*) amount to be deducted if all excavation and backfilling are done by Government; (*d*) amount to be added to the price named if 12-in. supply main from reservoir is made 14 in. in diam. with necessary change in specials: The Snare & Triest Co., 143 Liberty St., New York, N. Y., *a* $67,757, *b* $11,200, *c* $9,900, *d* $2,800; Michael J. Dady, 350 Fulton St., Brooklyn, *a* $72,300, *b* $11,600, *c* $8,700, *d* $3,000.

Juarez, Mex.—Nelson Rhodes, Jr., of the firm of O'Brian & Rhodes, Const. & Contr. Engrs., Nassau Bldg., Denver, Col., is stated to have completed plans for the proposed water works, to cost about $200,000. Sylvano Montemayor, Mayor.

Glace Bay, N. S.—It is stated that bids will be received by N. F. McNeil until July 4 for supply of water pipes, excavation of pipe line, laying, etc.

SEWERAGE AND SEWAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Tuscumbia, Ala.—The Sanitary & Plumbing Co., of Florence, is reported to have secured a contract for sewers at Tuscumbia, to cost $2,000. It is stated that the system will be extended later on, Engr. A. G. Negley, of Florence, having completed survey for a sewerage system for the entire city.

Tuskaloosa, Ala.—It is reported that bids will be received until July 10 by F. G. Blair, Mayor, and the Bd. of Aldermen, for furnishing materials and constructing about 2 miles of 8 to 15-in. pipe sewer.

La Jolla, Cal.—C. S. Dearborn, Deputy Co. Clk., writes that an election will be held on July 22 to vote on issuing $21,000 bonds for iron pipe sewers. G. A. de Hemecourt, City Engr., San Diego.

San Francisco, Cal.—The Bd. of Superv. on June 19 is stated to have authorized the construction of a storm sewer with appurtenances on 4th St., bet. Brennan and Berry Sts., at a cost of $75,000.

Durango, Colo.—The question of constructing a sewerage system is reported under consideration here.

Grangeville, Idaho.—The question of constructing a sewerage system is reported under consideration here.

Rock Falls, Ill.—Walter Murray, Mayor, writes that bids will be received on July 7 for the construction of about 4 miles of pipe sewers.

**East St. Louis, Ill.*—The Geisel Const. Co., of St. Louis, Mo., has secured the contract for constructing sewers on 21st and 22d Sts., Trendley Heights (bids opened June 20).

Danville, Ill.—A storm water sewer will probably be constructed on North St., from the Aetna House eastward to Stony Creek.

Chicago, Ill.—Bids will be received until July 5 by the Bd. Local Improv. (And. M. Lynch, Pres.) for constructing sewers, with manholes and catch basins, in portions of numerous streets; also 6-in. drains in portions of 3 streets.

Winamac, Ind.—The Town Bd. is reported to have decided to construct a new sewerage system.

Franklin, Ind.—It is reported that bids are wanted July 11 for the construction of sanitary sewers to cost $25,000. Otis B. Sellers, City Engr.

Columbus, Ind.—Bids will be received until July 6 by the Common Council for constructing 1½ miles of main sewer and laterals; estimated cost, $8,900. Geo. Vorvald, City Clk.

Wichita, Kan.—The City Council is reported to have authorized the Sewers and Drainage Com. in conjunction with City Engr. Brown to prepare a report on the best method of draining the central and northern portion of the city.

Covington, Ky.—Bids are wanted July 10 for the construction of a concrete sewer along and under Bullock St., as advertised in The Engineering Record.

Lexington, Ky.—Thos. A. Combs, Mayor, writes that Hering & Fuller, of New York, N. Y., have been engaged as consulting engineers for the proposed sewerage system, and bids will be called for as soon as plans and specifications are approved.

Louisville, Ky.—According to local press reports plans are under way looking to the construction of the proposed southwestern outfall sewer; it will be about 8 miles in length and cost $1,100,000. Charles F. Grainger, Mayor; J. F. Breed, City Engr.

Baltimore, Md.—The Sewerage Comn. has been organized with Gen. Peter Leary, Jr., Chmn., and Harry W. Rodgers, Secy. Engineers Frederic P. Stearns, of Boston, Mass., Rudolph Hering, of New York, N. Y., and Saml. M. Gray, of Providence, R. I., have been selected as a commission to submit plans for sewage disposal.

Marshall, Minn.—It is stated that bids will be received until July 8 by John R. Gray, City Recorder, for 2,699 ft. 15 and 10-in. sewers.

St Louis, Mo.—The lowest bid opened by the Bd. of Pub. Improv. on June 21 for repairs to sewers, is stated to have been submitted by the Prendergast Contr. Co., 5,858 Maple Ave., for $37,237.

**Marysville, Mo.*—The Boyd Constr. Co., F. G. Shoemaker, Associated, of Marysville, are reported to have secured the contract for sewer work on June 6, for $18,374.

Ferguson, Mo.—The citizens are reported to have voted to issue $8,000 bonds for the construction of a sewerage system.

Brooklyn, N. Y.—Borough President Littleton, on June 23, signed a sewer map for territory in Brooklyn and Queens, which calls for a 4-mile sewer, 17 ft. in diameter. Beginning at Forest Park, the sewer will run through Myrtle Ave., to St. Nicholas Ave., in Brooklyn, to Scott St. and to the Newtown Creek. The flooded districts, which will be relieved, are Ridgewood, the 28th Ward, Glendale and Middle Village. The section of the sewer in Brooklyn will drain about 500 acres, and will cost $1,077,000. The plan, which is being worked out in conjunction with Borough President Cassidy, of Queens, will soon be submitted to the Bd. of Estimate and Apportionment for approval.

Rensselaer, N. Y.—Bids will be received until July 5 by the City Clk. for constructing 8 and 12-in. sewers in portions of 6 streets.

Chatham, N. Y.—Dr. Eugene H. Porter, State Comr. of Health, is stated to have recommended the installation of a sewerage system, at an early date. E. M. Wilcox, Village Pres.

Buffalo, N. Y.—Bids will be received July 16 by the Dept. Pub. Wks. (Francis G. Ward, Comr.) for furnishing materials and constructing a 15, 12 and 10-in. tile sewer in a portion of Kenefick Ave.

**Morgantown, N. C.*—W. E. Walton, Chmn. Sewer Com., writes that the contract for 23,000 ft. 6 and 8-in. pipe sewers (bids opened July 1) has been awarded to Guild & Co., of Chattanooga, Tenn.

Providence, R. I.—Bids are wanted July 12 for excavation, changing and constructing abutments and construct-

Minidoka, Idaho.—Bids were opened at the office of D. W. Ross, Engineer U. S. Reclamation Service, Boise, Idaho, June 15, for the construction of 21 miles of main canals and about 102 miles of branches and laterals, etc., in connection with the Minidoka project. The work is divided into seven Schedules, namely 1 to 7: Bates & Rogers Constr. Co., of Chicago, Ill., bid only on Schedule 1—$296,000. Nelson Rich, of Prosser, Wash., bid on Schedule 2—$150,229, and Schedule 5—$22,862. Davidson & Tautphaus, Twin Falls, Idaho, bid for Schedule 4—$78,706, and Schedule 5—$22,922. Ray Hardisty, of Minidoka, bid for Schedule 5—$24,427. W. H. Philbrick & J. E. Hilton, of American Falls, Idaho, bid for Schedule 3—$174,507, and Schedule 5—$22,862. United Iron Wks., Oakland, Cal., bid for Schedule 8—$12,128. Conway, Wilhite & Ryberg, of Boise, Idaho, Schedule 4—$86,142. Hubbard H. Carlson, of Boise, submitted the lowest bid on Schedule No. 2, as follows: 977,000 cu. yds. excav., Class 1—12 cts.; 5,950 cu. yd. excav., Class 2—20 cts., and 238,400 cu. yds. overhaul, 1¼ cts.; total, $121,494. They also bid on Schedule 6—$132,200. Monarch & Porter, of Des Moines, submitted the lowest bid on Schedule 3, as follows: 1,239,500 cu. yds. excav., Class 1—10.4 cts.; 12,800 cu. yds. excav., Class 2—35 cts.. 2,100 cu. yds. excav., Class 4—85 cts., and 166,100 cu. yds. overhaul, 1 ct.; total, $137,184; they also submitted lowest bid on Schedule 4—570,750 cu. yd. excav., Class 1—9.3 cts.; 8,100 cu. yd. excav., Class 2, 35 cts., and 172,800 cu. yd. overhaul, 1 ct.; total, $57,643. The Vulcan Iron Wks., of Chicago, submitted the lowest bid on Schedule No. 8, $9,471; Orman & Crook, of Pueblo, Colo., submitted the lowest bid on Schedule No. 7, which consists of bridges and structures; total, $30,438. The following four bidders bid on Schedules 1 to 6: (*a*) Orman & Crook, of Pueblo, Colo., (lowest bidder of Schedules Nos. 1, 5 and 6); (*b*) Utah Constr. Co., Salt Lake City, Utah; (*c*) Kilpatrick Bros. & Collins, Beatrice, Neb.; (*d*) Griffiths & McDermott, Chicago, Ill.

Schedule 1—	*a*	*b*	*c*	*d*
417,400 cu. yd. excav., Class 1	0.14	0.15	0.16	0.15
5,000 cu. yd. excav., Class 2	0.30	0.40	0.30	0.37
32,600 cu. yd. excav., Class 3	0.36	0.50	0.45	0.40
105,800 cu. yd. excav., Class 4	0.95	1.10	1.10	1.23
12,160 cu. yd. riprap	1.33	1.00	1.50	1.35
28,900 cu. yd. overhaul, per 100 ft.	0.01½	0.02	0.01	0.01½
Total	$188,788	$210,028	$217,863	$224,483
Schedule 2—				
977,700 cu. yd. excav., Class 1	0.12½	0.13	0.16	0.124
5,950 cu. yd. excav., Class 2	0.27	0.40	0.30	0.37
238,400 cu. yd. overhaul, per 100 ft.	0.01½	0.02	0.01	0.01¼
Total	$127,395	$134,249	$160,601	$126,416
Schedule 3—				
1,239,500 cu. yd. excav., Class 1	0.12¼	0.13½	0.16	0.124
13,800 cu. yd. excav., Class 2	0.27	0.40	0.30	0.37
2,100 cu. yd. excav., Class 4	0.95	1.30	1.10	1.40
166,100 cu. yd. overhaul, per 100 ft.	0.01½	0.02	0.01	0.01½
Total	$160,051	$178,904	$206,431	$164,235
Schedule 4—				
570,750 cu. yd. excav., Class 1	0.12¼	0.13	016	0.13½
8,100 cu. yd. excav., Class 2	0.27	0.35	0.30	0.37
172,800 cu. yd. overhaul, per 100 ft.	0.01½	0.02	0.01	0.01½
Total	$74,696	$80,488	$95,478	$82,640
Schedule 5—				
175,400 cu. yd. excav., Class 1	$.12¼	0.13	0.20	0.13½
6,000 cu. yd. overhaul, per 100 ft.	$.01½	0.02	0.02	0.01½
Total	$21,576	$22,922	$35,200	$23,769
Schedule 6—				
323,000 cu. yd. excav., Class 1	0.14	0.15	0.17	0.18
5,000 cu. yd. excav., Class 2	0.35	0.40	0.30	0.43
10,000 cu. yd. excav., Class 3	0.37	0.50	0.45	0.43
65,000 cu. yd. excav., Class 4	0.97	1.25	1.01	1.40
20,000 cu. yd. overhaul, per 100 ft.	0.01½	0.02	0.01	0.01½
Total	$114,020	$137,100	$132,610	$155,890

**Items marked thus give the names of parties awarded contracts.*

**Waterbury, Conn.*—The following are the bids opened June 20 for constructing Sec. 1 of the Main Carrier, a reinforced concrete and brick intercepting sewer (R. A. Cairns, City Engr.): (a) McGovern Constr. Co., Trenton, N. J. (contract awarded); (b) Crouse Constr. Co., Perth Amboy, N. J.. (c) John W. Gaffney, Waterbury, Conn.; (b) Bell Eng. & Constr. Co., New York, N. Y.; (e) Fred. E. Shaw, Providence, R. I.; (f) Fred T. Ley Co., Springfield, Mass.; (g) The Neff Co., New York, N. Y.

	**a*	*b*	*c*	*d*	*e*	*f*	*g*
2905 lin. ft. Earth Excav., Sec A, open trench	$3.75	$4.65	$8.50	$6.55	$11.25	$10.95	$16.50
778 lin. ft. Earth Excav., Sec. B, tunnel	8.00	4.40	19.50	15.10	25.00	21.00	16.50
1510 lin. ft. Earth Excav., Sec. C, open trench	4.00	4.71	8.00	9.73	15.00	15.35	15.00
17 lin. ft. Earth Excav., Sec. D, tunnel	6.00	20.50	14.00	20.00	40.00	20.00	30.00
100 lin. ft. Earth Excav., Sec. E, open trench	4.00	8.29	9.00	7.21	11.00	11.50	19.00
25 cu. yd. Rock Excav., Class A, open trench	4.00	3.50	3.50	3.50	4.50	3.00	4.00
25 cu. yd. Rock Excav., Class B, open trench	5.00	5.50	10.00	4.50	12.00	4.50	8.00
60 cu. yds. Brick Mas'y (excpt in tunnel arch)	15.00	11.34	18.00	11.80	17.00	15.00	19.00
2905 lin. ft. Mas'y, Main Carrier, Sec A, open trench	5.00	3.54	5.50	5.18	3.00	3.50	3.25
778 lin. ft. Mas'y, Main Carriers, Sec. B, tunnel	10.00	6.48	7.00	10.42	10.00	7.50	5.75
1510 lin. ft. Mas'y, Main Carrier, Sec. C, open trench	6.00	11.29	10.80	17.85	7.00	9.75	8.00
17 lin. ft. Mas'y, Main Carrier, Sec. D, tunnel	35.00	8.00	22.50	11.50	20.00	30.00	19.00
100 lin. ft. Mas'y, Main Carrier, Sec. E, open trench	6.00	5.24	6.00	5.70	3.25	3.85	3.50
100 cu. yd. Concrete Mas'y (outside limits of Stand. Sec's) Class B	8.00	7.25	8.00	8.40	6.00	8.50	7.50
100. cu. yd. Concrete Mas'y (outside limits of Stand. Sec's) Class C	7.00	7.12	6.00	8.00	5.50	7.75	6.75
1500 sq. yd. Slope Paving	2.00	1.50	1.50	1.50	1.50	2.25	2.00
Inlet and Connections (lump sum)	500.00	190.00	150.00	192.00	200.00	125.00	210.00
Trunk Sewer Cons. (lump sum)	2,000.00	5,546.00	6,950.0	6,260.00	3,500.00	5,250.00	5,500.00
Timber Bulkhead (lump sum)	100.00	20.00	200.00	25.00	150.00	20.00	120.00
Total	$64,445	$68,702	$104,163	$108,678	$112,974	$115,919	$124,192

Newark, N. J.—Bids were opened June 22 by the Bd. Street & Water Comrs. (Edw. S. Rankin, Engr.) for the Clinton Annexation sewers, Section 3. Bids were submitted separately on the 1st and 2d Division. It has not yet been decided whether to use brick, cement or concrete block. The following are the totals of bids received on the 2d division, also details of the 1st Division: (1) brick sewer, (2) concrete, (3) concrete block: (*a*) McGovern Constr. Co., Trenton, (2) $39,086, (3) $39,429; (*b*) Harrison Constr. Co., Newark, (1) $34,213, (2) $33,213, (3) $32,838; (*c*) Wm. J. McCloud, Elizabeth, N. J., (1) $37665, (2) $36,095; (*d*) Antonio Costa, Orange, (1) $29,968; (*e*) Donato Fusco, Montclair, (1) $34,784; (*f*) James A. Christie, Newark, (1) $30,930, (2) $30,748, (3) $30,888; (*g*) J. R. Shanley, Newark (bid only on 1st Division).

	a	*b*	*c*	*d*	*e*
2,060 ft. 3-ft. brick sewer	—	$4.95	$4.35	$4.88	$4.24
2,060 ft. 3-ft. concrete sewer	$3.75	4.75	3.65	4.88	3.95
2,060 ft. 3-ft. concrete block sewer	4.00	4.30	3.75	4.80	3.55
640 ft. 3-ft. 6-in. brick sewer	—	5.90	5.32	5.30	4.50
640 ft. 3-ft. 6-in. concrete sewer	4.00	5.75	4.50	5.30	4.05
640 ft. 3-ft. 6-in. concrete block sewer	4.25	4.90	4.55	5.20	3.70
425 ft, 3-ft. 6-in. x 5 ft. brick sewer	—	8.70	7.50	12.68	7.25
425 ft. 3-ft. 6-in. x 5-ft. concrete sewer	6.00	9.35	6.55	12.60	6.93
425 ft. 3-ft. 6-in. x 5 ft. concrete sewer, reinforced	6.50	8.50	6.75	12.60	6.80
580 ft. 3-ft. 6-in. x 6-ft. brick sewer	—	14.65	10.50	13.12	11.90
580 ft. 3-ft. 6-in. x 6-ft. concrete sewer	8.50	14.20	8.74	13.10	11.80
580 ft. 3-ft. 6-in. x 6-ft. concrete sewer, reinforced	9.00	13.00	9.00	13.10	9.80
1,270 ft. 10-in. pipe sewer	.82	.85	.90	1.02	1.04
970 ft. 12-in. pipe sewer	.99	.95	1.00	1.20	1.19
260 ft. 15-in. pipe sewer	1.35	1.65	1.50	1.47	1.49
1,650 ft. 18-in. pipe sewer	1.52	1.75	1.72	1.73	1.85
1,850 ft. 20-in. pipe sewer	1.95	2.65	3.45	2.75	3.48
240 ft. 24-in. pipe sewer	2.20	2.45	2.70	2.70	3.30
240 ft. 24-in. concrete block sewer	2.00			2.70	2.55
10 basins with granite heads	90.00	120.00	108.00	100.00	105.00
20 basins with concrete heads	75.00	105.00	108.00	100.00	90.00
24 manholes over brick sewers	50.00	30.00	37.50	40.00	35.00
34 manholes over pipe sewers	50.00	50.00	45.00	50.00	40.00
250 ft. 6-in. house connections	.70	.75	1.00	.30	.80
Total for brick sewer	—	$42,883	$39,934	$43,610	$39,993
Total for concrete sewer	$32,188	42,390	36,543	43,564	38,733
Total for concrette block sewer	33,414	39,862	37,017	42,335	36,470

Norwood, O.—City Engr. J. A. Stewart, Traction Bldg., Cincinnati, is stated to have completed plans for a sewage disposal system, which he estimates at $27,000; he also estimates the cost of improving Norwood Ave., from Wesley to Main Sts., at $6,198.

Portsmouth, O.—The Bd. of Public Service (John M. Wendalkin, Clk.) will receive bids on July 8 for a concrete culvert, 12 ft. in diam. and 166 ft. long (circular) on 8th St. at Lawson's Run—98 cu. yds. dry excav. and 98 cu. yd. wet excav. and 1 m. ft. sheet piling. B. C. Pratt, City Engr.

Cincinnati, O.—City Engr. Breen is stated to have reported that the survey for the big Millcreek Valley intercepting sewer has been completed to Ivorydale, where it will connect with the Bloody Run sewer when completed.

**Warren, O.*—Fred Kleinman, of Findlay, is reported to have secured the contract for constructing sewers here, for about $18,000.

St. Bernard, O.—It is stated that bids will be received until July 12 by Geo. Meyer, Village Clk., for furnishing materials and constructing sewers in several streets. J. A. Stewart, Engr., Traction Bldg., Cincinnati.

**Xenia, O.*—The Williams & Hounker Co., of Springfield, are stated to have secured the contract for constructing sewers in the new district for $16,400.

Portland, Ore.—It is reported that surveys have been made in City View Park and Sellwood for a uniform system of sewers, in all about 2½ miles of mains; probable cost of work contemplated, $28,000.

Altoona, Pa.—Bids will be received until July 7 by the Bd. Pub Wks. (And. Kipple, Chmn.), for constructing a reinforced concrete storm sewer in portions of 5th Ave. and 24th St.; also same date for constructing a system of vitrified clay pipe sewers to include approximately 25,570 ft. of 8, 10, 12 and 15-in. sewers, with 34 air inlets, 30 manholes, 1,521 6 and 8-in. Y branches and 17 eighth bends.

**Indiana, Pa.*—Thos. Arrigo, of Charleroi, is stated to have secured the contract for constructing sewers (bids opened June 15) for about $10,000.

**Providence, R. I.*—The following are reported to be the bids opened on June 23 by the State Sanatorium Comn. at Providence, for the construction of a sewage plant at the Wallum Pond Institution: Mitchell & Johnson, of Boston, Mass., $5,390 (awarded contract); E. K. Watson, of Warren, $7,619, and J. J. Newman, of Providence, $8,700.

Laurens, S. C.—Bids are wanted July 25 for constructing a sewerage system, approximately 7 miles of pipe sewer from 8 to 18 in., as advertised in The Engineering Record.

Waco, Tex.—R. B. Dickey, City Secy., writes that the date of opening of bids for the 18th St. sewer has been extended from June 22 to July 6. Jas. B. Baker, Mayor.

Ogden, Utah.—Bids are wanted July 22 for the construction of sewers in Sewer Dist. No. 10; estimated cost, $85,000. A. F. Parker, City Engr.

Norfolk, Va.—See "Water."

Easton, Pa.—The Sewer Com. is reported to have decided to ask Council for an appropriation of $18,000 for improvements to the sewerage system.

Seattle, Wash.—The City Council has passed an ordinance providing for sewers on 4th Ave., N., and other streets, at a cost of $8,900.

Green Bay, Wis.—The Council is stated to have authorized the construction of 16 new pipe sewers, 10, 12, 15, 18 and 24-in. diam.

Parral, Mex.—Nelson Rhodes, Jr., of the firm of O'Brian & Rhodes, Nassau Bldg., Denver, Col., is reported to have completed plans and estimates for a sewerage system for Parral, to cost about $500,000.

BRIDGES.

Notes Arranged Alphabetically by States.

Rockport, Ind.—It is reported that bids are wanted until July 8 for constructing an 80-ft.-span, steel bridge. D. D. O. Moore, Aud.

Anderson, Ind.—It is stated that bids will be received until July 18 by the Bd. Co. Comrs. for constructing 5 concrete arches. J. D. Kinnard, Co. Aud.; E. J. Wilcox, Co. Engr.

**Emrichsville, Ind.*—H. W. Klausman, Co. Engr., Indianapolis, writes that the following are the bids opened June 27 for the construction of a bridge over White River at Emrichsville: Moore-Mansfield Constr. Co., $154,630; Central States Bridge Co., $141,293 (awarded contract); Wm. Fife & Son, $150,504, and E. M. Graves, $156,240.

Wellington, Kan.—It is stated that bids will be received until July 10 by the Co. Comrs. for constructing a steel bridge over Chikaskia River. C. A. MacDonald, Co. Clk.

North Adams, Mass.—The following are the bids opened June 21 by the Comr. of Public Wks. for (a) superstructure (steel only) for one span plate girder bridge, 82 ft. long, 28 ft. r'way and 2 sidewalks, about 5 ft. 6 in.; (b) taking down, repairing and re-erecting old 75-ft. plate girder bridge: Owego Bridge Co., Owego, N. Y., (a) $9,978, (b) $1,440; Groton Bridge Co., Groton, N. Y., (a) $11,000, (b) $1,700; The United Constr Co., Albany, N. Y., (a) $9,549, (b) $1,549; Springfield Constr. Co., Springfield, Mass., (a) $11,300, (b) $1,800; Boston Bridge Wks., Boston, Mass., (a) $11,517, (b) $1,826; New Eng. Structural Co., Everett, Mass., (a) $10,882, (b) $1,718; Canton Bridge Co., Canton, O., (a) $12,150, (b) $1,700.

Atlantic, Mass.—It is stated that plans have been completed for the 4-track steel bridge which the New York, New Haven & Hartford R. R. Co. proposes constructing across the Neponset River between Atlantic and Neponset stations, to replace the present wooden structure. Colin M. Ingersoll, Ch. Engr., New Haven, Conn.

Springfield, Mass.—It is reported that the city officials are considering the construction of the Plainfield bridge at a cost of about $12,000.

Newton Upper Falls, Mass.—The Metropolitan Park Comn. of Boston, Mass., is stated to have decided to construct a reinforced concrete bridge and dam over Charles River at Boylston St. It will have one 50-ft. span and a 14-ft. span.

**Hancock, Mich.*—The Wisconsin Bridge Co., of Milwaukee, Wis., it is reported, has received the contract to construct the drawbridge across Lake Portage between Hancock and Houghton at a cost of $70,922.

Springwells (P. O. Detroit, Mich.)—Bids will be received until July 8 by Wm. Unruh, Township Clk., for constructing a riveted, low-truss, highway bridge on Dearborn Road, over Roulo Creek, Springwells Township, Wayne County; distance between parapet walls to be 75 ft. and to have a 16-ft. clear roadway.

Ft. Snelling, Minn.—It is stated that the bridge it is proposed constructing across the Mississippi at Ft. Snelling is to cost about $250,000 and is to be 48 ft. wide. The Co. Comrs. at Minneapolis may be able to give further information.

Rutledge, Minn.—Bids will be received until July 7 by the Village Council for furnishing materials and constructing a bridge across Pine River; R. H. Doe, Recorder.

Hopkins, Minn.—It is stated that the Twin City Rapid Transit Co. (D. W. Dozier, Ch. Engr., Minneapolis) has decided to construct a bridge over the tracks here.

Independence, Mo.—It is stated that bids will be received until July 8 at the office of the Co. Clk. for constructing a 45-ft. steel bridge, bid to include a 3-years' maintenance guarantee.

**Allenhurst, N. J.*—The New Jersey Bridge Co. is stated to have received the contract for erecting a bridge over Deal Lake between Allenhurst and Interlaken for $8,550. Bids opened June 19 by the Co. Bd. Chosen Freeholders.

Plainfield, N. J.—The Com. appointed by the Union County Bd. of Freeholders to investigate the necessity of a bridge over Greenbrook at West End Ave. is stated to have decided in favor of constructing a structure, at a cost of $7,000.

Paterson, N. J.—The lowest bid opened June 22 by the Joint Com. of Freeholders from Passaic and Bergen Counties for constructing Passaic draw bridge is stated to have been submitted by the Owego Bridge Co., of Owego, N. Y., their bid being $64,500 and $5,000 additional for creosoted block paving.

New York, N. Y.—The Bd. of Estimate and Apportionment has entered into an agreement with John B. McDonald, contractor of the Rapid Transit R. R., for the removal of the bridge over Harlem River ship canal at 221st St. and Kingsbridge Road, and to erect same at W. 207th St., Manhattan Boro., and E. 184th St., Bronx Boro., and providing an issue of $80,000 bonds to pay for same. The Kingsbridge Ry. Co. will also pay the contractor $35,000, and the N. Y. Central & Hudson River R. R. Co. $12,000, as their share of the expense.

Utica, N. Y.—The building of bridges across the barge canal between Utica and Deerfield is reported under consideration.

Weldon, N. C.—Attorney T. C. Harrison, of Weldon, writes that it is proposed to construct a steel bridge across Roanoke River, to cost about $35,000.

Cleveland, O.—Bids will be received until July 14 by the Bd. Pub. Service (A. R. Callow, Secy.) for furnishing materials and constructing a concrete-steel, stone-faced arch under the W. & L. E. Ry., in Brookside Park.

Prospect, O.—The County Comrs. at Marion are stated to have received the following bids for constructing a bridge near here: Mt. Vernon Bridge Co., $8,425; Illinois Bridge Co., $9,750; Huston Bridge Co., $8,990; King Bridge Co., $8,700; Virginia Bridge Co., $8,700; Marion Bridge Co., $7,757.

Marietta, O.—It is stated that bids will be received until July 18 by the Bd. Co. Comrs. for constructing 2 bridges, 100 and 120 ft., respectively. Bids for both iron and wood will be accepted. A. F. Cole, Co. Engr.

Sandusky, O.—It is stated that bids will be received until July 10 by the Bd. Co. Comrs. for constructing a steel-centered, concrete arch, complete, in Oxford Township. Chas. Kubach, Co. Aud.

Pittsburg, Pa.—Secretary Taft, it is reported, has ordered the Pittsburg Union Bridge across the Allegheny River to be reconstructed at once and raised to a height of 70 ft. above the river.

Reading, Pa.—Bids will be received until July 7 by Horace F. Livingood, Co. Comp., for constructing a steel-truss superstructure, with plank flooring and masonry work, over Moselem Creek at Rothermel's Mill, in Richmond Township.

Des Moines, Ia.—The building of a viaduct at 7th St. is reported under consideration.

Pawtucket, R. I.—The Bd. of Aldermen has passed a resolution ordering the New York, New Haven & Hartford R. R. Co. (Colin M. Ingersoll, Ch. Engr., New Haven, Conn.) to immediately repair and alter the Lonsdale Ave. Bridge.

Items marked thus give the names of parties awarded contracts.

Providence, R. I.—Bids will be received until July 12 for constructing new piers in Providence River at Point St. Bridge, as advertised in The Engineering Record.

Waco, Tex.—It is stated that bids including plans and specifications will be received until July 6 by Jas. B. Baker, Mayor, and the Street Com., for constructing bridges at N. 2d St. and Barrons Branch and at Vermont St. and Barrons Branch, to be 50-ft. clear span and either steel-girder trusses or reinforced concrete; for further information address City Engr.

Graham, Tex.—It is stated that Young County will construct 2 steel bridges over Brazos River. Address J. W. Akin, Co. Judge.

Milwaukee, Wis. — Press reports state that bids are wanted until July 12 for the following bonds authorized by the Common Council: $100,000 for 27th St. viaduct, $120,000 for schools, $100,000 for docking and dredging, $95,000 for the Fire Dept., and $50,000 for permanent repairs for the Police Dept.

PAVING AND ROADMAKING.

Notes Arranged Alphabetically by States.

Florence, Ala.—It is stated that the contract will soon be let for macadamizing about one mile of College St.

San Jose, Cal.—J. G. McMillen, County Surveyor, is making a survey for a highway from San Jose to Big Basin, to be a scenic and pleasure route. It will be about 12 miles in length and cost from $25,000 to $30,000.

Bridgeport, Conn.—Bids are wanted July 17 for laying about 13,000 sq. yds permanent pavement as advertised in The Engineering Record.

Wilmington, Del.—It is reported that the following road improvements are to be made in New Castle County by the State Highway Dept.: Hare's Corner Road, $10,000; Faulk Road, Brandywine Hundred, $10,000; Middletown to Duck Creek, $6,000; Newark Depot and Pencader Road, $6,000; Summit Bridge to Mt. Pleasant, $6,000; Lancaster Pike, $6,000; extension of Elsmere Road in direction of Newark, $5,000; Newark Road in direction of Marshallton, $5,000.

Tampa, Fla.—It is reported that bids will be received on July 25 for paving to cost about $600,000.

Centralia, Ill.—The Bd. of Local Improv. has directed the Iowa Eng. Co., of Clinton, Ia., to prepare plans and estimates for 89,000 sq .yd. brick pavement.

**Moline, Ill.*—The McCarthy Constr. Co., of Davenport, Ia., it is reported, has received the contract to pave 13th Ave. from 9th to 15th Sts. at $14,200.

Chicago, Ill.—Bids will be received until July 7 by the Dept. Pub. Wks. (Jos. M. Patterson, Comr.) for furnishing and delivering 3 new or second-hand steam road rollers.

**East St. Louis, Ill.*—McCabe & Co., 411 Olive St., St. Louis, Mo., have secured the contract for paving 22d, 23d and 24th Sts., Trendley Heights, a suburb of East St. Louis (bids opened June 20), to consist of 20,363 sq. yd. brick for a total cost of $29,729. Mark Bird, of East St. Louis, secured the contract for laying granitoid sidewalks on 21st and 22d Sts.

Terre Haute, Ind.—The Bd. of Pub. Wks. is stated to have decided to resurface with asphalt N. 7th and S. 5th Sts., at an estimated cost of $23,000.

Crownpoint, Ind.—It is reported that bids will be received until July 15 for constructing about 33 miles of gravel road in Center Township, known as the Wheeler Road; Wallace L. Allman, Co. Aud.

**Bedford, Ind.*—The City Council is stated to have awarded (bids opened June 20) the contract for paving with Terre Haute pressed vitrified blocks with stone sidewalks on a portion of J St. to Robt. Noegel, of Greensburg, for $16,815.

Vincennes, Ind.—It is reported that bids will be received until July 5 for constructing 8 gravel roads, aggregating about 212,840 ft.; separate bids to be submitted for each road; L. M. R. Ansbottom, Co. Aud.

Indianapolis, Ind.—Bids will be received until July 7 by the Bd. Pub. Wks. (M. A. Downing, Pres.) for grading and paving the sidewalks with cement on portions of St. Paul, Cincinnati, Vigo and 32d Sts.; also grading and graveling a portion of Vigo St.

Logansport, Ind.—Bids will be received by the City Clk. July 8 for 14,071 sq. yd. Warren bitulithic pavement and 6.674 ft. cement curb and gutter. Walter A. Osmer, City Engr.

**Bedford, Ind.*—Wm. M. Denniston, City Clk., writes that Robt. Naegel, of Greensburg, has secured the contract for about 1,705 lin. ft. brick paving, stone sidewalk and curb on J St. for $16,814 (bids opened June 20). David Y. Johnson, of Bedford, bid also for the work $22,642.

**Iowa City, Ia.*—It is reported that the Barber Asphalt Paving Co. of Des Moines has secured the contract to pave with Warren's bitulithic on Iowa Ave. from Dubuque St. and Woodlawn at $1.96 per sq. yd. (bids received June 9). The estimated quantities are 18,552 sq. yd. of pavement, 12,010 lin. ft. of combined curb and gutter, and 6,600 lin. ft. of tile and drain; excavation, 7,000 cu. yd.

Des Moines, Ia.—The following are reported to be the bids opened by the Bd. Pub. Wks. on June 15 for paving with brick about 2,500 sq. yd. on Forest Ave.: King-Lambert Constr. Co., $1.63⅞; O. P. Herrick, $1.67; Jas. Horrabin, $1.77, and J. C. Likes, $1.67.

Clarinda, Ia.—Engr. Wm. Christie, Jr., of Red Oak, writes that the date of opening of bids for the laying of approximately 10,380 sq. yds. brick paving and 6,955 lin. ft. curb, has been extended from July 7 to July 14. Bids will be received by the City Clk. at Clarinda.

**Wichita, Kan.*—The Cleveland Trinidad Paving Co., Rose Bldg., Cleveland, O., is stated to have received the contract for paving with asphalt about 19,500 sq. yds. on Main St. and Douglas Ave., at $1.54 per sq. yd.

Shreveport, La.—Bids will be received until Aug. 8 by C. G. Rives, City Comp., for paving with asphalt, brick or pavement similar to bitulithic or bitulithic 34,653 sq. yd. on portions of 15 streets.

Baton Rouge, La.—This city proposes to pave about 3 miles of new streets during the coming season; R. Swart, City Engr.

New York, N. Y.—The following are the bids opened June 20 by Louis F. Haffen, Pres. Bronx Boro., for regulating and grading, setting curb, flagging, etc., Bryant Ave., from Westchester Ave. to Boston Road: (*a*) J. C. Voorhies; (*b*) Troy Public Wks. Co.; (*c*) A. G. Vermilye; (*d*) P. J. Kane, (*e*) M. Marrone; (*f*) P. J. Duffy; (*g*) Gallo & Pettelli; (*h*) W. F. Murray.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
9,80 cu. yd. earth excav.	$0.90	$0.60	$0.50	$0.65	$1.00	$0.89	$0.60	$0.80
6,800 cu. yd. rock excav.	2.20	1.50	1.60	1.75	1.45	1.89	1.65	1.55
10,150 cu. yd. fill	—	0.01	0.05	0.01	0.01	0.01	0.15	0.02
9,350 lin. ft. new curb	0.80	0.80	0.85	0.85	1.00	0.80	0.75	0.99
37,700 sq. ft. new flag	0.24	0.25	0.25	0.24	0.26	0.25	0.22	0.23
925 sq. ft. new bridgestone	0.60	0.60	0.60	0.60	0.85	0.50	0.60	0.45
350 yd. dry rubble mas'ry	2.00	1.50	1.50	1.50	2.00	1.00	2.00	1.50
Total	$41,613	$34,216	$34,740	$36,522	$40,401	$39,443	$35,284	$37,452

New Orleans, La.—It is reported that the Barber Asphalt Paving Co. bid for paving on portions of Toulouse St. and 2 portions of Iberville St. at an average of about $2.44 per sq. yd.

The Warren Asphalt Paving Co. of Cambridge Mass., it is reported, bid $11,000 for the asphalt repair paving plant.

Elkton, Md.—Bids will be received until July 11 by the Bd. Co. Comrs. (Levi E. Patterson, Pres.) for grading and macadamizing about 1 mile of the public highway between Perryville and Aiken.

Boston, Mass.—Bids will be received until July 15 by Mordecai T. Endicott, Bureau Yards and Docks, Navy Dept., Washington, D. C., for brick paving and concrete sidewalk at the Navy Yard, Boston.

**Worcester, Mass.*—The contract for paving a portion of Main St. with bituminous macadam is stated to have been awarded to J. J. Howard at $2.15 per sq. yd.

Charlotte, Mich.—C. W. Morrell, Mayor, writes that bids are wanted July 6 for about 22,000 sq. yds. paving.

Detroit, Mich.—The City Council on June 20 passed the resolution to issue $150,000 bonds to build a boulevard subway under the railroad tracks south of Visger St. and to issue $100,000 bonds to complete the boulevard roadways.

Marquette, Mich.—It is reported that the Council has rejected all the bids received for paving College Ave. The bids submitted were as follows: James J. Byers & Co., Houghton—Macadam, $26,748; asphalt block, $56,853; creosoted wood block, $51,017. Barber Asphalt Co.—Bitulithic paving, $45,195; asphalt, $48,267. Central Bitulithic Co.—Asphalt, $43,798; bitulithic, $48,352.

Benton Harbor, Mich.—The City Council is stated to have decided to pave with brick and macadamize portions of 4th St.

Lansing, Mich.—The City Engineer has been instructed to prepare plans and estimates of the cost of paving Capitol Ave. between Kalamazoo and Allegan Sts. and Washtenaw St. between Townsend St. and Washington Ave.

Niles, Mich.—The Common Council has passed a resolution to pave with bitulithic on 4th St., in all a distance of about 1 mile.

**Kalamazoo, Mich.*—The Cleveland Trinidad Paving Co. of Cleveland, O., it is stated, has secured the contract to pave on Academy St. from West St. to Michigan Ave. with sheet asphalt on a 6-in. concrete foundation at $1.81 per sq. yd., and Albert Prang the contract to pave on Eleanor St. from Burdick to Church St. at $1.74 per sq. yd., the material to be Metropolitan block and the cost to be about $6,000.

It is stated that the paving of Main St. at a cost of $20,000 and Rose St. at a cost of $30,000 is under consideration.

St. Paul, Minn.—Bids will be received by the Bd. Co. Comrs. until July 17 for macadamizing portions of St. Paul, White Bear, Bald Eagle, West Town Line and the Patten Road in this county. E. G .Kranmer, Co. Aud.

**St. Louis, Mo.*—The Bd. of Pub. Improv. is stated to have awarded contracts for paving as follows: Fruit-Barnbrick Constr. Co., 721 Olive St., Hunt Ave., $21,561; Fruin & Colmon, Laclede Bldg., Warne Ave., $16,582, Manchester Ave., $29,705, and Granite Bituminous Paving Co., 405 N. 6th St., Florissant Ave., $32,097, 13th St., $14,496.

Omaha, Neb.—The following bids are reported to have been opened June 20 by the City Council for paving with (a) asphalt, (b) brick on portions of, (A) Leavenworth St., (B) 33d St., (C) Douglas St., (D) Capitol Ave; (price given per sq. yd.): Barber Asphalt Paving Co., (A a), $2.08, (B a) $2.04, (C a) $1.81, (D a) $1.62; Chas. E. Fanning, (A b) (2 bids) $1.80 and $1.85, (B b) (2 bids) $1.98 and $2.02, (C b) (2 bids) $1.89 and $1.93, (D b) (2 bids) $1.22 and $1.26; John Grant (A a) $2.10, (B a) $2.20, (C a) $2, (D a) $1.40; Hugh Murphy, (A a) $2.21, (A b) (3 bids) $1.77, $1.79 and $1.99, (B a) $2.33, (B b) (3 bids) $2.08 to $2.31, (C a) $2.12, (C b) (3 bids) $1.27 to $2.20, (D a) $1.55, (D b) (3 bids) $1.32 to $1.56. Each contractor submitted bids on various classes of material.

Newark, N. J.—The paving of Central Ave. from High St. to the city line with brick or bituminous macadam is reported under consideration.

**Newark, N. J.*—Wm. Van Keuren, of Jersey City, is stated to have received the contract for paving with brick a portion of 5th St., for $13,886.

Flemington, N. J.—Bids are wanted July 24 for macadamizing Old York Road a distance of 29,323 ft., as advertised in The Engineering Record.

Newark, N. J.—Press reports stated that bids will be received until July 6 by the Bd. Wks., for paving portions of 5 streets, and for grading, curbing and flagging a portion of Grafton Ave., to cost about $50,000.

Irvington, N. J.—Bids will be received until July 5 by M. Stockman, Town Clk., for curbing and flagging a portion of Clinton Ave.; Ed. R. Halsey, Town Engr., 164 Market St., Newark.

Leonia, N. J.—It is stated that bids are wanted until July 5 for grading and macadamizing Harold St. and Woodbridge Pl.; probable cost, $8,000; Willard Cass, Engr., Englewood.

New York, N. Y.—Bids will be received until July 6 by the Park Bd. (John J. Pallas, Pres.) for repairing asphalt roadway pavements where directed, Boro. Manhattan.

Brooklyn, N. Y.—The Bd. of Estimate & Apportionment, it is stated, on June 23 voted to pave Bedford Ave. from Eastern Parkway to Malbone St. with asphalt block and between Malbone St. and Flatbush Ave. with sheet asphalt, the cost to be about $120,000. The Bd. also authorized improvements in the Flatbush Dist. costing $40,000, which will be expended in paving and in new sewers. Douglas St., in the Bushwick Dist., will be paved.

Long Island City, L. I., N. Y.—Bids will be received until July 10 by Jos. Cassidy, Pres. Boro. Queens, for regulating, grading, curbing and paving portions of Carver St. and 9th Ave.; also for grading, curbing and laying sidewalk on portions of Radde and Crescent Sts. Engineers' estimate: 5,600 sq. yds. asphalt blk.; 6,450 lin. ft. concrete curb, furnished and set; 21,500 sq. ft. cement sidewalk; 9,100 sq. ft. new flagstone, etc.; Boro. Queens.

Albany, N. Y.—The following are reported to be the bids opened by the Bd. Contract & Supply June 19 for resurfacing South Pine St. from Myrtle Ave. to Cortland St., in all about 5,150 sq. yd.: North Hudson Contr. Co., $1.33 per sq. yd.; M. F. Dollard, $1.85 per sq. yd.; Barber Asphalt Paving Co., $1.49 per sq. yd.; Warner-Quinlan Asphalt Paving Co., $1.49 per sq. yd.

Mayor Gans is stated to have approved the following ordinances providing for the resurfacing with sheet asphalt on Delaware Ave., also the paving of N. Swan St.

Buffalo, N. Y.—The Barber Asphalt Paving Co., it is stated, bid $6,676 for paving with asphalt on Harmonia St. from Sycamore St. to Walden Ave., and Miller & Franklin for paving the same with shale brick at $7,490.

Bids will be received July 7 by the Dept. Pub. Wks. (**Francis** G. Ward, Comr.) for repairing asphalt pavements out of guarantee and not beyond repair, for the fiscal year 1905-1906.

Syracuse, N. Y.—The property owners, it is stated, have adopted a resolution favoring Bermudez asphalt for Midland Ave. and recommending that the contract be awarded to the Warner-Quinlan Co. The cost of this improvement is reported to be about $50,000.

**Corning, N. Y.*—The following are reported to be the totals of the bids received June 15 by the Bd. Pub. Wks. for paving on E. Market St., the quantities being as follows: 7,500 sq. yd. of pavement of Corning brick, 2,500 cu. yd. of excav., 300 ft. of protective curb and 3,000 lin. ft. of curb: McGreevy Constr. Co., Ithaca, $13,654 (awarded contract); Thomas Fitzgerald, Jr., Fredonia, $14,350; M. L. Siver & Co., Sidney, $14,675; M. E. Gregory, Corning, $15,013; John J. Higgins, Waverly, $15,635; Hinman & Sproul, Schenectady, $16,997.50; J. E. Rawlins, Elmira, $17,336.

**Niagara Falls, N. Y.*—Langley & Cook, of Niagara Falls, South, has secured the contract for paving (bids opened June 17) at the following bid: 5,880 sq. yd. brick paving, $2.27; 246 lin. ft. new curb set in gravel, 54 cts.; 860 lin. ft. old curb reset in concrete, 26 cts.; 4 catch basins, each, $60, and excav., 45 cts. per cu. yd.; total bid, $13,944. The other bids received were: S. P. McMordie, Niagara Falls, $14,565; Toronto Contr. & Paving Co., Toronto, $13,332; Forest City Paving Co., London (two bids), $14,080 and $15,785, and Constr. & Paving Co. of Ont., Toronto (three bids), $13,638, $13,285 and $13,167. John Robinson, City Clk.; J. H. Jackson, Engr.

**Ft. Totten, N. Y.*—Capt. G. W. McManus, Q.-M., U. S. A., writes that contracts have been awarded as follows (bids opened June 23): To Lawrence Collins, of Whitestone, for grading and roads, $15,103; to P. B. Elkins Co., Boston, Mass., for sidewalks, $6,105, and to Brinton C. Bell, of Bayside, L. I., for a pond, $2,247.

Rochester, N. Y.—The Rochester Vulcanite Pavement Co., of Rochester, is stated to have submitted the lowest bid for paving with asphalt Melville St., for $6,841.

Xenia, O.—The City Council is stated to have authorized the issue of $38,000 street improvement bonds.

**Fremont, O.*—The contract for paving with Logan block W. State St. is stated to have been awarded to Garrigan Bros., of Toledo, for $36,099.

**Massillon, O.*—Harold Howard, City Engr., writes that Meinhart & Son, of Massillon, have secured the contract for 18,668 sq. yd. brick paving on an 8-in. gravel foundation, sand cushion and cement filler at $1.09 for paving and 38 cts. per lin. ft. for curb, Massillon brick to be used.

**Steubenville, O.*—T. W. Vance, Clk. Bd. Pub. Service, writes that the contract for paving a portion of 6th and 7th Sts. (bids opened June 23) has been awarded to Harry M. Bates, of Steubenville.

Columbus, O.—An ordinance has been passed by the Council authorizing an additional $11,000 bond issue for the Long St. improvement.

Norwood, O.—See "Sewerage and Sewage Disposal."

Portland, Ore.—The improving of a portion of 1st St. at a cost of $5,319 and Randolph St. at a cost of $2,138 is reported under consideration· also the improving of West Park St. by paving with bituminous macadam.

Panama.—The following are the bids opened on June 24 by the Isthmian Canal Com., Washington, D. C., for 3,000,000 paving brick, *a* brick, *b* block (price given per M): Indiana Paving Brick & Block Co., Indianapolis, Ind., *a* $30, *b* $40, c. i. f. Colon; Lineham & Colo, Dubuque, Ia., *a* $30.40, *b* $37.50, c .i. f. Colon; Montello Brick Wks., Reading, Pa., *a* $14.60, *b* $20.40, f. o. b. Jersey City; Wm. Wirt Clark & Son, Baltimore, Md., *a* $21.*b* $26, f. o. b. N. Y.; E. P. Morris & Co., New York, N. Y., *a* $33.15, c. i. f. Colon; Auburn Shale Brick Co., Auburn, Pa., *a* $22.50, f. o. b. New York; American Trading Co., New York, N. Y., *b* $41.95, c. i. f. Colon; **Kaaterskill Paving Brick Co.**, through agent at Reading, Pa., *a* $12, *b* $15, f. o. b. Kaaterskill; Hamburg Vitrified Brick Co., Philadelphia, Pa., *a* $32.85, *b* $43.06, c. i. f.

Items marked thus give the names of parties awarded contracts.

Colon; Federal Clay Products Co., Philadelphia, *a* $28.50, *b* (2 bids), $42.50 and $43.50; Reeve Hammond Fire Brick Co., Washington, D. C., *a* $24.10, *b* $34.50, f. o. b. Colon, shipped from Baltimore, Md., additional charge from New York and Philadelphia; Shawmut Paving Brick Co., Washington, D. C., *a* (2 bids), $28.95 and $32.50, *b* (2 bids), $34 and $36, f. o. b. Colon, shipped from Baltimore, additional charge from New York and Philadelphia.

Williamsport, Pa.—The Guise Brick & Stone Co. is stated to have submitted on June 24 the lowest bid for paving E. 4th St. and 3d Ave. with Guise block at $1.55 per sq. yd.

**New Haven, Pa.*—P. J. Flynn, of South Connellsville, is stated to have secured the contract for paving about 4,830 sq. yd. on 6th St. for about $8,000.

Washington, Pa.—The following bids are stated to have been received for paving Hess Ave.: Zelt & Bros., Vulcan brick, $5,872; Hollam Constr. Co., Pittsburg, wire-cut pavers, $4,489, and Wm. Pickett & Co., Pittsburg and Buffalo, brick, $5,987.

West Homestead, Pa.—The Boro. Council June 20 decided to proceed with the sale of the $70,000 bonds and to receive bids for grading and paving the streets.

**Homestead, Pa.*—The contract to grade and repair the Homestead Park, it is reported, has been awarded to the Monroe-Blake Co., of Homestead, at $14,000.

**Pittsburg, Pa.*—The Moran-Phelan Contr. Co., Ferguson Blk., it is reported, has received the contract to grade, pave, curb and construct sewers in the Oakland Dist. for the Schenley Park Land Co., 4203 5th Ave., at a cost of about $150,000.

It is stated that bids will be received until July 6 by the Bd. Co. Comrs. for improving roads throughout the county. F. W. Patterson, Co. Road Engr., 29 Court House.

**Wilkesbarre, Pa.*—The Warren-Quinlan Asphalt Co. has secured the contract for paving Ross St. at $4.50 per cu. yd. for concrete; $9 per cu. yd. for binder and $1.23 per sq. yd. for surfacing.

Providence, R. I.—It is stated that bids will be received until July 12 by the State Bd. Pub. Roads for constructing about 50,460 ft. of state highways in various towns.

Marlin, Tex.—E. P. Hutchings, City Secy., writes that the city is corresponding with engineers with a view to having streets and alleys graded and drained. This work will be done during present summer. Other street improvement later.

**Bellingham, Wash.*—T. Ryan, of Seattle, is stated to have received the contract for paving with brick a portion of Holly St. for $20,209.

Seattle, Wash.—Bids will be received by C. B. Bagley, Secy. Bd. Pub. Wks., July 8 for grading Grand Boulevard and other streets, estimated cost $31,600; also same date for paving 2d Ave. and other streets with asphalt, estimated cost $103,600, to consist of 10,000 cu. yd. earthwork, 27,100 sq. yd. asphalt paving, 3,380 sq. yd. brick gutters, 9.578 lin. ft. granite curbs (straight), 553 lin. ft. granite curbs (curved), 1,350 lin. ft. 12-in. pipe sewer, 306 lin. ft. 15-in. pipe sewer, 8 manholes, 16 catch basins (single inlets), 7 catch basins (double inlets), 30,850 sq. yd. gravel foundation and 8 monument cases.

Ordinances have been passed by Council providing for the regrading of 3d Ave. and other streets at a cost of $75,000; grading and concrete walks on E. Fire St., $21,500; grading Atlantic St., $7,150, and grading 26th Ave., $10,900.

Rhinelander, Wis.—Bids will be received until July 27 by the Bd. Pub. Wks. (Richard Reed, Chmn.) for furnishing materials, grading, curbing and paving with macadam portions of 7 streets.

**Superior, Wis.*—E. A. Dahl, 1109 N. 6th St., is stated to have received the contract for paving with macadam on Winter St. at $1.07 per sq. yd., or $6,467 for the improvement.

**Milwaukee, Wis.*—Henry Hase, it is reported, has secured the contract to pave with granite and brick at a total cost of $31,019.

POWER PLANTS. GAS AND ELECTRICITY.

Notes Arranged Alphabetically by States.

Brighton, Ala.—Press reports state that the City Council will award a franchise on July 6 for the construction and operation of an electric lighting plant and water works.

Ventura, Cal.—C. E. Moore, Consulting Engr., Santa Clara, writes that the proposed electric light plant for Ventura, will cost $25,000, and the water works $100,000. It is uncertain when contracts will be let, as the matter is delayed by litigation.

Wilmington, Del.—The Street and Sewer Dept. is stated to have on June 23 granted a franchise to the Wilmington Light, Heat & Power Co.

Washington, D. C.—Bids will be received July 18 at the Bureau Supplies and Accounts, Washington, for furnishing at the navy yards, etc.., Portsmouth, N. H.; Boston, Mass.; Newport, R. I.; New York, N. Y., and Washington, D. C., a quantity of naval supplies as follows: Incandescent lamps, motors, motor drive, electrical supplies, wire, cable, Portland cement hydrants, c. i. pipe and specials, parts for salt water and condenser pumps, Hecla copper, bar steel, angles and plates, broken stone, red and pressed brick, etc. H. T. B. Harris, Paymaster Gen., U. S. N.

Bids will be received until July 5 at the Bureau of Supplies and Accounts, Navy Dept., Washington, D. C., to furnish at the Navy Yard, Washington, D. C., and the Naval Academy, Annapolis, Md., a quantity of naval supplies, including electrical supplies, incandescent lamps, transformer, conduit, electric wire, steel angles, plates and forgings. H. T. B. Harris, Paymaster Gen., U. S. N.

Chicago, Ill.—See "Public Buildings."

Savanna, Ill.—The Council is reported to be considering the question of establishing a municipal lighting plant.

**Iowa City, Ia.*—Wm. Horrabon, of Iowa City, has secured the contract for constructing concrete dam across Iowa River (bids opened June 13 by the Bd. Regents, State Univ.) at the following bid, including dam and power house foundation, but not c. i. gates: 3,100 cu. yds. earth excav., 90 cts.; 100 cu. yds. rock excav., $2; 1,000 cu. yds. borrowed earth, 45 cts.. 360 lin. ft. bearing piles, 30 cts.; 12 M. ft. sheet piling, $60; 1,209 cu. yds. concrete below el., $4.85; 1,323 cu. yds. above el., $5; 15,000 lbs. steel, 3 cts.; total about $16,458. In additional he bid for c. i. gates, $6,900. The following are the totals of other bids received for work complete, including c. i. gates: Savage Constr. Co., Chicago, Ill., $39,998; Carroll Constr. Co., St. Louis, Mo., $34,866; W. D. Lovell, Minneapolis, Minn., $28,966; Blake Bros., Madison, Wis., $45,341; Schillinger Bros. Co., Chicago, Ill., $22,868, and Bartlett & Klong, Cedar Rapids, Ia., $28,849.

Clarence, Ia.—The citizens are reported to have voted to issue bonds for the construction of a gas plant.

Dayton, Ia.—The Dayton Heating & Lighting Co. is reported organized, with C. D. Waterbury Pres. and H. E. Nelson Secy. and a capital of $10,000, to construct a heating and lighting plant.

Spirit Lake, Ia.—This city is reported to have decided to expend about $6,000 in improving the electric light plant.

Pittsburg, Kan.—Bids will be received until July 12 by the Home Light, Heat & Power Co. (E. V. Lanyon, Pres.) for furnishing machinery and apparatus for its new light and power station, as follows: One 375 to 400 h.p. gas engine, direct connected; one 225 to 250 h.p. gas engine, direct connected; one 250-kw., 3-phase, 2,300-volt, 60-cycle generator, direct connected to above gas engine; one 150-kw., 3-phase, 2,300-volt, 60-cycle generator, direct connected to above gas engine; 100 to 150-light, 3-phase, series arc lamp transformer and regulator; marble switchboard and station wiring, etc.; 100 6.6-amp., series, enclosed arc lamps; 3,600 light, commercial lighting transformers in large sizes; 1 second-hand, belted, 125-kw., 3-phase, 2,300-volt, 60-cycle generator with instruments. Owen Ford, Engr., Security Bldg., St. Louis. Mo.

McDonoghville, La.—The McDonoghville Water Power & Improvement Co. is reported incorporated, with a capital of $100,000, to construct water works and an electric light plant. Incorporators: Henry Hart, C. A. Chandler, T. Landry and others.

**Shreveport, La.*—The City Council is stated to have on June 23 accepted the bid of the Shreveport Gas, Electric Light & Power Co. to light the city for 6 years.

Bangor, Me.—The Bodwell Water Power Co. has been organized, with Chas. V. Lord as Pres. and Wm. P. Hubbard as Treas., and it is reported that contracts for dams, power houses and transmission lines will be let on July 3.

Ft. McKinley, Me.—The following are reported to be the bids opened on June 20 by Capt. A. W. Yates, Q. M., U. S. A., Portland, for an electric lighting and power distributing system at Ft. McKinley: Malcolm W. Hill Co., Boston, Mass., $14,441; Edwin C. Lewis, Boston, Mass., $12,998, and Jos. W. Roman & Co., New York, N. Y., $16,730.

Kokomo, Ind.—The Kokomo Gas & Light Co. is reported incorporated with a capital of $100,000, to establish a plant to furnish light, heat and power in Kokomo and other towns and cities. Directors, Alex. Lindemann, K. L. Ames and others.

Baltimore, Md.—Harry F. Hooper, City Registrar, writes that the matter of awarding contract for furnishing illuminating gas (bids for which were to have been opened June 14) has been extended to July 26.

Clinton, Mass.—The Clinton Gas & Electric Co. is stated to have decided to borrow $250,000, a part of which will be expended for improvements.

Lawrence, Mass.—The Lawrence Gas Co. is reported to have in contemplation the installation of an additional power plant.

Wyandotte, Mich.—The Wyandotte Fuel & Light Co. is reported to have decided to lay this summer 2½ miles of gas pipe.

**Warren, Minn.*—J. G. Robertson, of St. Paul, is stated to have secured the contract for a 125-h.p. boiler and engine for the electric light plant and the Ft. Wayne Electric Wks., Ft. Wayne, Ind., for a 75-kw. dynamo; total cost, $6,225.

**Alma, Neb.*—Fairbanks, Morse & Co., of Omaha, have secured the contract for a producer gas plant for $4,850, and MacKean, Ball & Co., Chicago, Ill., for the balance of water and light plant for $15,740 (bids opened June 22). Engineer, M. A. Earl, First Nat'l Bank Bldg., Chicago, Ill.

Newark, N. J.—The Bd. of Wks. on June 22 approved the resolution directing Morris R. Sherrerd, Ch. Engr. and City Surveyor, to ascertain the cost of equipping either the Belleville or the Clifton Ave. Pumping Station as an experimental municipal lighting plant.

South Orange, N. J.—The Village Bd. of Trus. is stated to have appointed a committee, with President Sinclair as chairman, to inquire into the municipal ownership of an electric light plant.

Jersey City, N. J.—The Southern Power Co. is reported to have been incorporated at Trenton on June 22, with a capital of $7,500,000, to furnish power for light and heat. Incorporators: R. B. Arrington, E. B. Sperry and W. R. Journeay, Jr., all of Jersey City.

**New York, N. Y.*—The following are the bids opened on June 26 by C. B. J. Snyder, Supt. School Bldgs., for installing electric equipment in School 38, Manhattan Boro.: Reis & O'Donovan, $13,200; O. K. Electrical Const. Co., $12,830; Peet, McAnerney & Powers, 225 4th Ave., $11,775 (awarded contract); Commercial Const. Co., $12,845, and T. Fred Jackson, $12,580.

North Tonawanda, N. Y.—It is stated that bids are wanted until July 5 for lighting the city for a period of 2 years from Aug. 1, 1905. Geo. J. Smith, City Clk.

Gloversville, N. Y.—Bids will be received until July 10 by the Secy. Treas. Dept., Washington, D. C., for furnishing and installing in the U. S. Postoffice, Gloversville, certain combination gas and electric light fixtures. C. Keep, Asst. Secy.

Cairo, N. Y.—The Cairo Electric Light & Power Co. is reported incorporated, with a capital of $80,000. Directors: C. E. Hewitt and M. G. Hubbard, of Chatham, N. J., and F. G. Walters, of Cairo.

Brooklyn, N. Y.—Bids will be received until July 10 by C. B. J. Snyder, Supt. School Bldgs., New York City, for installing electric equipment in additions to School 110, Boro. Brooklyn.

Salisbury, N. C.—See "Electric Railway."

Albemarle, N. C.—The Albemarle Light & Water Co. is reported incorporated with a capital of $25,000, by A. L. Patterson, J. M. Morrow and others; all of Albemarle.

Galion, O.—The Crawford Gas & Electric Co. is reported to have petitioned for a franchise to construct a power house in Galion and for permission to erect poles, string wires, etc.

Arcanum, O.—Bids will be received until July 6 by Bd. Trus. of Public Affairs (W. W. Hadfield, Pres.) for constructing a water works and electric light plant at Arcanum. T. C. Hefel, Engr., Muncie, Ind.

Youngstown, O.—The Hauk Manufactured Gas Co. is reported to have decided to construct a plant here. Chas D. Hauk is the chief promoter.

Seaside, Ore.—The Seaside Electric Co. is reported incorporated by Dan J. Moore, A. S. Frosted, and others.

Shippensburg, Pa.—S. A. Angle, Chmn. Electric Light Com., writes that the Council has appointed a committee to solicit correspondence and secure information relating to cost and expenses of constructing and operating a municipal electric light plant. The present contract does not expire until Oct. 1906.

Center, Tex.—The electric light plant owned by Fleshman & Harkrider, is stated to have been destroyed by fire.

Dallas, Tex.—A. E. Mockett, Gen. Mgr. Dallas Gas Co., writes that about $200,000 will be expended for improvements.

Coalville, Utah.—The citizens are reported to have voted to issue $10,730 bonds for an electric light plant.

Providence, Utah.—A. M. Hammond, Town Clk., writes that it is proposed to construct an electric light plant, at a cost of $12,000.

Kennewick, Wash.—C. E. Wood, of Genesee, is stated to have petitioned Council for a franchise for water works and an electric light plant.

Ft. Lawton, Wash.—The Seattle Electric Co., of Seattle, is reported to have submitted the lowest bid for installing electric light at Ft. Lawton for $13,576.

Snohomish, Wash.—The plant of the Snohomish Electric Light & Water Power Co. is reported to have been destroyed by fire.

Tacoma, Wash.—The City Council on June 22 granted a power franchise to the Seattle-Tacoma Power Co.

An ordinance was introduced in Council June 22 providing for the construction of a municipal water power electric generating plant. The resolution was referred to the Fire and Water Com.

Charleston, W. Va.—See "Electric Railways."

Rio, Wis.—The Milwaukee Engr. Co., 50 Hathaway Bldg., Milwaukee, are preparing plans for improving the plant of the Electric Light Co., at Rio; probable cost of work proposed $5,000.

Guelph, Ont.—The citizens are reported to have voted June 24 to expend $55,000 for extending and improving the gas plant.

Picton, Ont.—The Glendora Power Co., of Picton, is reported incorporated, with a capital of $100,000.

ELECTRIC RAILWAYS.

Notes Arranged Alphabetically by States.

Los Angeles, Cal.—The Los Angeles Pacific R. R. Co. is reported to have purchased property on Sunset Boule. and Reno St., as a site for a new power house and substation.

Norwich, Conn.—The R. R. Com. of the Legislature has made a favorable report on the resolution incorporating the Lebanon St. Ry. Co. The charter authorizes the company to construct and operate a street railway in Norwich, Bozrah, Franklin, Lebanon and Columbia.

Willimantic, Conn.—The bill incorporating the Willimantic & Stafford St. Ry. Co. has been passed with two amendments, adding South Street in Willington to the route between Mansfield Center and Stafford Springs, and allowing the company to use water powers in the towns of Windham, Mansfield, Willington, Coventry, Ellington and Tolland. The incorporators of the new company are: Chas. W. Comstock, Edwin W. Higgins, Llewellyn J. Storrs and Costello Lippitt; capital $700,000. The company is authorized to sell its surplus electricity for light or power in any territory where a regularly organized company is not now operating. The company is chartered to build an electric railway in Windham, Mansfield, Willington and Stafford. It will build from the railroad station in Willimantic to Mansfield Center, thence to South Willington through Spring Hill, Storrs and Mansfield and on to Stafford Springs.

San Bernardino, Cal.—Gen. Mgr. Smith, of the Arrowhead Reservoir Co., is reported interested in the construction of an electric railroad from San Bernardino to the summit of the mountains, directly north of that city, a distance of about 20 miles.

Worcester, Mass.—It is reported that the stock of the Hartford, Manchester & Rockville (Conn.) Tramway Co. has been transferred to the American Loan & Trust Co., of Boston, in the interests of the Hartford, Springfield & Worcester Electric Co. The transfer is in furtherance of the plans of Jas. F. Shaw, of Boston, and those associated with him in building a continuation of the Boston & Worcester St. Ry. to Hartford and Springfield. It is announced that the construction of the link between Rockville and Worcester will be begun at once.

Fitchburg, Mass.—The Fitchburg & Princeton St. Ry. Co. is being organized to build and operate a line from the terminus of the Worcester & Northern St. Ry. at Princeton, through Westminster, to make connection with the Fitchburg & Leominster St. Ry. Albion R. Clapp, of Wellesley Hills; Henry W. Warren, of Holden; Henry C. Delano, of Princeton, are reported interested.

Riverton, N. J.—The Camden & Trenton Ry. Co. is reported to be considering the construction of a line through Riverton and direct to Philadelphia by way of Palmyra and West Palmyra.

Syracuse, N. Y.—The Syracuse & South Bay Ry. Co. is stated to have filed with the Secy. ot State a certificate of extension in its route, from Cicero to South Salina and Central Square Plank Road.

**Items marked thus give the names of parties awarded contracts.*

Brooklyn, N. Y.—The Bd. of Estimate on June 23 voted to issue $1,640,000 bonds required to put four tracks in subway on Fulton St., in accordance with resolution adopted by the Rapid Transit Comn.

Hickory, N. C.—The Bd. of Aldermen is stated to have granted a franchise to the Hickory Electric Ry., which is to be commenced in a short time, and in full operation by Oct. 1, 1906. Col. M. E. Thornton and associates, who will build the road, also have a charter to Catawba Springs, the line to which they will build as soon as the city lines are completed.

Salisbury, N. C.—The Salisbury-Spencer Ry. Co., which operates electric lights, gas and electric railways in the two towns named, is reported to have been purchased by Edward M. Deane & Co., bankers, of Grand Rapids, Mich. The service will be improved, new equipment will be secured for the traction lines and a new coal gas plant installed; capital, $400,000. E. M. Deane, Pres., and Frank M. Deane, Secy.

Cleveland ,O.—The Felton ordinance, granting the Cleveland Electric Ry. Co. a franchise to operate a street railway in Woodland Hills Ave., from B'way to Quincy St., and in Doan St. to the intersection of its present line at Superior St., has been passed by City Council.

West Chester, Pa.—Papers providing for three extensions have been filed here by the West Chester St. Ry. Co. One provides for a line to Coatesville from West Chester via Marshalltown, East Bradford, West Bradford and East Fallowfield Township and townships of Mortonfield and Modena. Another is for a line from Willowdale to a point on the Gap and Newport Turnpike and close to Avondale. The third line is to extend from West Chester, to Wilmington, Del., touching Darlington's Corner and Dilworthtown, and Brandywine Summit, Elam, Johnson's Corner, thence on the Delaware State line.

**Easton, Pa.*—The McGawley Constr. Co., Easton, has secured the contract to build the line of the Delaware St. Ry. Co., from Easton to Martin's Creek, Pa., a distance of 8 miles. Eighty-pound rails are to be used. Work is now under way.

New Castle, Pa.—It is reported that a new interurban trolley line direct from this city to Sharon may be one of the first results of the coming merger of the Pennsylvania & Mahoning Valley and the New Castle & Sharon Companies. A direct line, it is said, will be built to Sharon by way of the Shenango Valley, through Pulaski, West Middlesex and Wheatland.

**Bloomsburg, Pa.*—The contract for the grading and general construction of the New Millville-Bloomsburg trolley line is reported to have been awarded to Thos. H. Reagan & Co., of Philadelphia.

Catawissa, Pa.—The work of surveying the Catawissa & Numidia Electric Ry. is stated to have proceeded to Raup's, about a half a mile below Numidia. The survey is such that there will be no necessity for going over the heavy grades on the big hills between Catawissa and Numidia. Considerable of the road as surveyed is over private right of way.

Jeannette, Pa.—Officials of the Jeannette-West Newton trolley line are reported to have signed a contract with the New England Constr. Co. to build the road. The line will be about 14 miles long and will run through Adamsburg, Edna, Madison and Herminie. In Jeannette it will connect with the Pittsburg-Greensburg line.

Waynesboro, Pa.—Rights of way for the Hagerstown-Waynesboro trolley line are reported to have been all about secured. The men interested in the road are now desirous of coming into Waynesboro over the Leitersburg Turnpike. Rights of way are reported to have been secured for the entire line in this state through private lands east of the turnpike, and that the point of entry into Waynesboro will probably be S. Broad St.

York, Pa.—The York St. Ry. Co. is stated to have decided to extend its trolley lines around the southwestern part of the city.

Columbia, S. C.—The Oconee County Ry. Co. is reported incorporated, to construct and operate a railway between Westminster and Townville and intermediate points, including Fair Play, the total length of the road to be 25 miles; capital, $50,000. Incorporators: W. P. Anderson, J. W. Shelor, Wm. Bibb, and others.

Nashville, Tenn.—The stockholders of the Nashville, Crocker Springs & Ridge Top Electric Ry. are reported to have elected W. P. Ready, Pres. and Gen. Mgr., and H. G. Hill, Secy. The railroad, which is to be built from Nashville to Crocker Springs at once and later extended to Ridge Top, will be equipped with gasoline motor electric cars. Rights of way are now being obtained.

Gainesville, Tex.—The City Council is reported to have granted Judge Hassinger and associates a franchise for an electric line.

Norfolk, Va.—The Ocean View & Pine Beach Ry. Co. is reported incorporated, to build and operate an electric road between Ocean View and Pine Beach; capital, $25,000. H. L. Page, Pres., M .C. Elliott, Secy.

North Yakima, Wash.—Jesse H. Rose, representing Minnesota capitalists, is reported interested in the construction of an electric railway to extend from North Yakima to the Naches, Ahtanum and Moxee Valleys, and later to Sunnyside.

Charlestown, W. Va.—Bids will be received by the Winchester & Washington Electric Ry Co. at Winchester, Va. (S. H. Hansbrough, Pres.) for constructing a concrete dam, raceway and wheelpits on the Shenandoah River near Charlestown for the proposed hydro-electric plant. N. Wilson Davis, Engr., Charlestown, W. Va., R. F. D. No. 1.

Manitowoc, Wis.—The Fox River Valley Ry. Co., which projects an interurban line from Sheboygan to Kaukauna, via Manitowoc, is stated to have secured a 35-yr. franchise from City Council.

Quebec, Que.—The promoters of the Quebec & Saguenay Ry. Co. are stated to have elected officers, Rodolphe Forget, pres., and J. A. Macdonald, secy. The new company propose to continue the present line of the Q. H. L. & P. Co. from St. Joachim to Tadousac, a distance of about 110 miles. The cost is estimated at $1,014,000.

RAILROADS.

Notes Arranged Alphabetically by States.

Mobile, Ala.—The Terminal R. R. Co. is reported incorporated with Colonel E. L. Russell, Pres., to construct the union passenger station, according to plans of the Southern R. R., and also to construct a terminal railroad into, through or around the city. The contract for the new station will be let as soon as the specifications for the second and third stories have been completed. The new station will be occupied by the Mobile & Ohio, Southern, and Mobile, Jackson and Kansas City railroads.

Anniston, Ala.—J. B. Hunter, of Anniston, is reported to be surveying for the extension of the Louisville & Nashville, R. R. from the LaGarde mines near Alexandria to Chalybeate Mountain and to iron ore properties around Chalybeate Mountain; length of proposed road is 7 miles.

Dothen, Ala.—H. M. Steele, of Atlanta, Ga., Pres. Enterprise Lumber Co., is reported interested in the construction of a railroad from Dothen, Ala., to St. Andrews Bay, Fla., a distance of about 100 miles.

Saginaw, Ark.—The Saginaw & Ouachita River R. R. Co. is reported incorporated, to construct a line from Saginaw Junction to a point opposite Saginaw, in Hot Spring County, a distance of 3 miles. Incorporators: F. M. Van Houten and J. C. Braswell of Saginaw, and C. D. Henderson of Little Rock.

San Francisco, Cal.—The Stone Canyon Ry. Co. is reported incorporated with a capital of $300,000 by J. A. Chanslor, W. A. Sloan, W. G. Stafford, and others, to construct a road 21 miles long, commencing at a point on the Southern Pacific line near San Miguel, and running northerly through San Luis Obispo and Monterey counties to Nelson Creek.

The Yosemite Short Line Ry. Co. is reported incorporated, with a capital of $1,250,000, to build a road from a point on the Sierra Ry. in Tuolumne County, 2 miles southwest of Jamestown, to a point in the Yosemite Valley. The road, from its connection with the Sierra Ry., will run in a general southwesterly direction, and will be 60 miles in length. A branch line is also planned from Crocker's Station, on the line of the Sierra Ry., into Hetch Hetchy Valley, a distance of 10 miles. Incorporators: F. J. Solinsky, Frank R. Wehe, John Hancock, and others.

Carrollton, Ga.—The Bd. of Trade is reported to have decided to build a railroad from Carrollton in a westerly direction to traverse the section including western Carroll and Heard and Randolph counties and Cleburne County, Alabama.

Augusta, Ga.—The stockholders of the Augusta Southern R. R. Co. (J. A. Hecther, Supt., Charleston, S. C.) are reported to have voted to make $100,000 worth of repairs on the road.

Albany, Ga.—The Albany & Northern R. R. Co. (J. S. Crews, of Albany, Vice-Pres. and Gen. Mgr.) is reported to have decided to extend its line from Albany to Colquitt.

Sparks, Ga.—The citizens of this place are reported to be in favor of the reconstruction of the Sparks, Moultrie & Gulf R. R.

Vinita, Ind. Ter.—A charter has been granted to the Vinita & Western Ry. Co., with headquarters at Guthrie and Vinita, I. T., with a capital of $10,000. The projected road runs from Vinita, northward into Kansas, through the counties of Montgomery, Chautauqua and Cowley, a distance of 140 miles, and two branch lines are provided, 20 and 85 miles in length, respectively. Incorporators: F. R. Pierce, of St. Louis, Mo.; F. Badgett, of Tonopah, Nev.; L. F. Parker, Jr., of Vinita; J. S. Mabon, of Guthrie, Okla., and others.

Des Moines, Ia.—The Iowa Falls & Northern R. R. Co. is reported to be considering the construction of a direct line to Des Moines, connecting Iowa Falls and Mason City.

Waterville, Me.—The directors of the Somerset Ry Co. (W. M. Ayer, Supt., Oakland) are stated to have decided to begin soon on the construction of an extension from Bingham to Birch Point on the west shore of Moosehead Lake, a distance of about 50 miles. Contracts will be awarded by sections and work will begin on the Birch Point end.

Saginaw, Mich.—The Saginaw & Southwestern Ry. Co. is reported incorporated, with a capital of $50,000. The line is to extend from Saginaw to St. Johns, a distance of 50 miles, via St. Charles, Chesening and Elsie. At St. Johns it will connect with the Lansing Suburban Company's line. Directors: Albert S. Courtright, Lansing; W. G. Emerick, Charles E. Linton, Saginaw.

New York, N. Y.—The War Dept. is stated to have approved the application of the New York & Long Island Ry. Co. for permission to construct a tunnel from foot of 42d St. across East River to 5th St., Long Island City.

Buffalo, N. Y.—The Buffalo, Lake Erie & Niagara R. R. Co., of Buffalo, has been incorporated, to operate a steam railroad, 27 miles long, from the Lake Erie shore in Hamburg, through Hamburg, West Seneca, Cheektowaga, Onherst, and Tonawanda to the International Bridge in Buffalo, together with a branch along the Niagara River; capital, $4,000,000. Directors: Clarence M. Bushnell, J. Henry Metcalf, Clarence MacGregor, and others, all of Buffalo.

**Ashland, Neb.*—Owens & Loveland, of Omaha, are stated to have secured the contract for the first ten miles of the Ashland extension of the Great Northern R. R., north of Ashland, and Callahan Bros. and Phelan & Shirley, of Omaha, secured contracts for the construction of 50 miles of road—one section near Yutan and one in the reservation.

ings, Watertown and Wau Bay.

Marion, N. C.—The Johnson City Southern Ry. Co. is reported incorporated by A. B. Andrews and F. H. Miller, of Raleigh; Alfred P. Thom, Fairfax Harrison, of Washington, D. C., and H. C. Amsley, of Alexander, Va., capital, $355,000. The road will extend 71 miles from Marion, N. C., up the north fork of Catawba River and down the valley of Toe River to the Tennessee line, there to connect with a railway to Johnson City.

Cincinnati, O.—The stockholders of the Cleveland, Cincinnati, Chicago & St. Louis R. R. Co. (G. W. Kittredge, Ch. Engr., Cincinnati) are stated to have voted June 21 to increase the common stock $11,300,000 for improvements.

Guthrie, Okla. Ter.—A charter has been granted here to the Mississippi Valley & Gulf Ry Co. with a capital of $100,000 and headquarters at Chicago. The company will construct a standard gauge railroad from a point adjoining Mississippi River in the state of Iowa to a point on or adjacent to the Arkansas River into the state of Ark., with branch lines. Incorporators: Elmer L. Gockanour of Keokuk, Ia., Grat P. Dalton, of Muscatine, Ia., Geo. A. Mason, of Chicago, Ill., H. W. Pentecost of Guthrie Okla. Ter., and others.

Philadelphia, Pa.—Mayor Weaver and Pres. Baer, of the Philadelphia & Reading Ry. Co., are stated to have agreed on plans for the abolition of grade crossings on 9th St., from Spring Garden St. to Huntington St.

Sioux Falls, S. D.—P. F. Sherman, Pres., and G. M. Root, Secy., of the South Dakota Central Ry., both of Sioux Falls, are stated to have filed with the secy. of state, resolutions for numerous extensions in the state. The main line is to extend from Colton in a northerly direction through the counties of Lake, Brookings, Kingsbury, Hamlin, Codington, Day, Marshall, and touching as its principal points the towns of Wentworth, Brook-

Dickson, Tenn.—See "New Industrial Plants."

**Maryville, Tenn.*—The Southern Ry. Co. is reported to have awarded to W. J. Oliver & Co., of Knoxville, the contract to build the Rabun Gap extension from Maryville to Bushnell, N. C., a distance of 46 miles.

Rockland, Tex.—The Rockland, Jasper & Northwestern Ry. Co. has been incorporated, with a capital of $100,000, to construct and operate a railroad from Rockland to Jasper, a distance of about 25 miles. Incorporators: W. W. Kyle, S. K. Stone, E. M. Wiess, and others, all of Beaumont.

Spokane, Wash.—The Spokane-Columbia River Ry. & Navigation Co. is reported organized to build a railway from Spokane in a southwesterly direction through Spokane, Whitman, Adams and Franklin Counties to a point on Columbia River. Incorporators: Edward Swanson and Wm. F. Kyle, of Spokane, Wash., and Willard S. Foster, of Cheney, Wash.

Tacoma, Wash.—The Tacoma Eastern R. R. Co. (Henry Shaw, Ch. Engr., Tacoma) is stated to have decided to extend its line not later than next year.

**Casper, Wyo.*—Kilpatrick Bros. & Collins are reported to have secured the contract to construct the grade of the Wyoming Central R. R., which is being built by the Chicago & Northwestern Ry. from Casper to the Wind River Indian reservation. The contract involves the grade for a distance of 104 miles.

PUBLIC BUILDINGS.

Notes Arranged Alphabetically by States.

**Lake Village, Ark.*—Albert G. Simms is stated to have received the contract for erecting the courthouse here for $33,400.

Ft. Rosecrans, Cal.—Capt. R. H. Rolf, Q. M., U. S. A., San Diego, writes that the following are the bids opened June 16 for construction, etc,, of post exchange and gymnasium at Ft. Rosecrans (bidders all of San Diego):

Construction, *a* stone foundation, *b* brick foundation: Chas. Engebretson, *a* $32,508, *b* $33,351; P. F. Schaniel, *a* $33,000, *b* $33,500.

a Plumbing, *b* heating: Thos. Mulhleisen, *a* $2,150, *b* $3,495; J. S. Johnstone & Son, *a* $2,350, *b* $3,150; C. H. Julian, *a* $2,350, *b* $3,275; Nichols & Heilbron, *a* $1,998.

**Washington, D. C.*—The Heine Safety Boiler Co., of St. Louis, has secured the contract for installing two water tube boilers in the old Post Office Bldg., now the General Land Office and Indian Office, for $6,693, and W. B. Upton, of Washington, secured the contract for reconstructing the boiler room to accommodate the new boilers, for $5,854.

Washington, D. C.—The following are the bids opened by the Comrs. D. C. on June 26 for erecting a police court building, *a* with one boiler, *b* with two boilers: I. Pavarini, *a* $74,365, *b* $75,000; Gleeson & Humphrey, *a* $74,500, *b* $75,400; W. E. Speir, *a* $74,699, *b* $75,599; A. B. Stannard, *a* $89,585, *b* $90,665; J. M. Dunn, *a* $93,462, *b* $94,662.

Mt. Vernon, Ga.—The plans of Alex. Blair, of Macon, are stated to have been approved for the Montgomery County Court House to be erected at Mt. Vernon, at a probable cost of $40,000.

Blue Island, Ill.—It is stated that the Sisters of St. Mary will erect a hospital here, to cost $70,000. Wm. J. Bringman, Archt., Chicago.

Chicago, Ill.—The Special Com. on City Hall (Alderman Walter J. Raymer, Chmn., 187 Dearborn St.) has presented to Edw. F. Dunne, Mayor, and the City Council the report of Architects Richard E. Schmidt, Wm. Holabird and Geo. Beaumont, all of Chicago, on the proposed improvements to the City Hall. They recommend changes in the building, to cost $190,200; additions, etc., to cost $175,500, and for heating and lighting plant, $143,500.

Indianapolis, Ind.—Bonds amounting to $50,000 are reported sold for erecting a courthouse in Elkhart County.

Williamsburg, Ind.—It is reported that bids are wanted until July 10 for erecting a town hall; J L. Juday, Town Clk.

Valparaiso, Ind.—It is stated that a Carnegie library will be erected here at a cost of $25,000.

**Lawrence, Ind.*—Capt. B. F. Cheatham, Q. M., U. S. A., of Lawrence, writes that contracts for construction, etc., of buildings at the military post near Indianapolis (bids opened June 14) have been awarded as follows:

Construction Proper.—To Heinzmann Bros., Noblesville, six double barracks, Q. M. storehouse and sub-storehouse, $260,500; to H. B. Walter Con. Co., Danville, Ill., 8 captains' and 6 lieutenants' quarters, $217,800; to Wolf & Ewing, Indianapolis, ordnance storehouse, oil house, coal shed, hay shed and shops, $13,906; to W. J. Turner Co., Chicago, Ill., for guard house, $18,998, and to the Wm. P. Jungclaus Co., Indianapolis, for commanding officer's quarters, $12,700; 4 field officers' quarters, $44,000; bachelor officers' quarters, $29,500; 2 non-commissioned staff quarters, $26,800; 1 non-commissioned staff quarters, $3,400; hospital, $31,400; band barracks, $13,600; administration building, $18,600; stable, $16,400; wagon shed, $3,500; fire engine house, $2,200; bakery, $8,300; granary, $9,900; total for Wm. Jungclaus, $220,300..

**Items marked thus give the names of parties awarded contracts.*

Heating 44 Buildings.—To J. S. Farrell & Co., of Indianapolis, for $53,939.

Plumbing 44 Buildings.—To Foley Bros. & Co., of Indianapolis, for $68,347.

[illegible] Powell & Dorste, Anderson, Ind., $661; The Royse Electric Co., Indianapolis, $2,538, and J. S. Farrell & Co., Indianapolis, $8,965.

Total cost of all work complete, $[illegible]5,954.

Manhattan, Kan.—It is stated that bids will be received until July 20 by the Bd. Co. Comrs. for erecting a courthouse. Claude M. Breese, Co. Clk.; Geo. A. Berlinghof, Archt., Beatrice, Neb.

Louisville, Ky.—The Bd. of Trus. of the Louisville Free Pub. Library, are reported to have directed Archts. Pilcher & Tachau, 32 E. 28th St., New York, N. Y., to procure bids for the construction of a library at 4th and York Sts. The bids will be opened Aug. 1; probable cost, $250,000.

St. Joseph, La.—Jos. Curry, Clk. of Court, writes that the citizens have voted to erect a courthouse to cost $38,000 and a jail to cost $12,000.

Ft. Williams, Me.—The following are the bids opened on June 20 by Capt. A. W. Yates, Q. M., U. S. A., Portland, for constructing band barracks at Ft. Williams: J. W. Burrows, Portland, $21,700, and Colin D. Rankin, Portland, $26,480.

Sykesville, Md.—Bids will be received until July 5 by the Bldg. Com. at the office of the Springfield State Hospital for electric wiring, plumbing and installing hot water heating and ventilating apparatus in the Edwin Warfield Cottage at said hospital. J. C. Clark, M. D., Supt.

Worcester, Mass.—The Com. on Finance and Pub. Bldgs. is stated to have recommended the erection of an engine house at School and Commercial Sts., at an estimated cost of $26,000.

Detroit, Mich.—Bids will be received on July 31 by Maj. Lansing H. Beach, Corps Engrs., U. S. A., for furnishing material and constructing wharf, oilhouse and buoy shed for a lighthouse depot on Minnesota Point, Minn., as advertised in The Engineering Record.

Adrian, Mich.—Bids will be received by the Superv. Archt., Treas. Dept., Washington, D. C., on Aug. 7 for the construction complete of U. S. Postoffice at Adrian, as advertised in The Engineering Record.

Crookston, Minn.—It is stated that the County Bd. proposes expending $15,000 for erecting a heating station for the county jail.

Fairmount, Minn.—The County Comrs. are stated to have on June 12 awarded the contract for plans for the courthouse to Bell & Detweiler, of Minneapolis; the probable cost of structure is $100,000.

New York, N. Y.—The following are the totals of bids opened on June 22 by John F. Ahearn, Pres. Manhattan Boro. for alterations in certain rooms; also for extension to electric lighting equipment, plumbing and heating, carpenter and cabinet work, fireproofing and other work, for the completion of Hall of Records, Boro. of Manhattan: John Pierce, 277 Bway, $1,449,000; Remington & Shannon Co., 38 Park Pl., $1,328,426; Van Dorn Iron Wks., Cleveland, O., $1,490,000, and R. E. Heningham, 4 Court St., Brooklyn, $1,363,500.

New York, N. Y.—Plans have been filed for a 3-story brick hospital to be erected on North Brothers Island for the city of New York, at a cost of $150,000. Smith, Westervelt & Austin, 7 Wall St.

Buffalo, N. Y.—The following bids are stated to have been opened June 20 by the Bd. of Superv. for plumbing in the 65th Regiment Armory: Edward Joy, $46,500; Dark & Co., $48,000; T. McEvoy & Son, $43,470; Barnd & Geiger, $48,821; John D. Smith & Co., $54,000; C. A. Criqui, $48,827.

Bids will be received until July 6 by the Secy, Armory Comn., S. N. Y., in the State Capitol, Albany, N. Y., for sheathing and finishing the ceiling of drill hall of the armory for the 65th Regt., N. G. N. Y., at Buffalo. Geo. J. Metzger, Archt.; office, 65th Regt. Armory.

Oswego, N. Y.—The following are reported to be the lowest bids received June 15 for constructing 2 sets of double barracks and a band barracks at Madison Barracks, Sacket Harbor: W. J. Burns, of Syracuse, for construction, $47,000 for each double barracks and $16,000 for band barracks; G. H. & E. E. Lowell, of Portland, Me., wiring, $747 for the barracks, and John W. Schaffer, of Oswego, $260 for the band barracks; The General Supply Co., of New York, plumbing each building $3,430, heating each building $3,368.

West Point, N. Y.—Bids will be received by the Quartermaster, U. S. A., on July 29 for constructing 2 barracks, 2 stables and a gun shed, as advertised in The Engineering Record.

Dover, N. H.—E. H. Frost, of Dover, is reported to have submitted the lowest bid for erecting the City Hospital for $44,999. J. H. Neally, Chmn, Bd. Trus.

Winston, N. C.—The following are the bids opened on June 21 by the Superv. Archts., Treas. Dept., Washington, D. C., for construction, including plumbing, heating, electric wiring and conduits of U. S. Post-Office at Winston: E. Hart, Norfolk, Va., $47,935; R. H. Richardson & Son, Hampton, Va., $49,972; C. C. Bownen & Co., Birmingham, Ala., $47,900; King Lumber Co., Charlotteville, Va., $47,740; Central Carolina Constr. Co., Greensboro, N. C., $59,617; Gen. Supply & Cons. Co., New York, N. Y., $37,440; Mankin Constr. Co., Richmond, Va., $47,673; R. T. Nordrop & Co., Knoxville, Tenn., $45,000; Miles & Bradt, Atlanta, Ga., $44,900.

Ft. Lincoln, N. D.—The following bids are stated to have been received June 16 by Lieut. R. H. Leavitt, Q. M., U. S. A., for constructing plumbing, heating and electric wiring brick field officers' quarters, brick double set captains, lieutenants and N. C. Q. quarters, and brick double barracks at Ft. Lincoln (bidders all of St. Paul, Minn., unless otherwise mentioned):

Construction work, Hennessy Constr. Co., $129,512; Ambrose G. Wall, St. Cloud, on barracks and captain's quarters only, $92,500; Clarence P. Smith, $143,320, and with brick foundation, $147,508.

Electric wiring: Nimes & Nimes, $2,022; Bergren Electric Co., $2,187.50; McBride Electric Co., $3,155; Electric Constr. Co., $3,152.

(a) Heating and (b) Plumbing: Dwyer Plumbing & Heating Co. (a) $8,705, (b) $12,392; Hurley & Co. (a) $7,947, (b) $13,974; Kees Domestic Engineering Co. (a) $8,028, (b) $12,448; J. P. Adamson, (b) $13,391; Earl & Cook, New York, (a) $8,596; Grambs & Wolbert, (a) $8,472, (b) $11,862.

Fargo, N. D.—The Lutheran Hospital Assoc. is stated to have directed Hancock Bros. to prepare plans for erecting a hospital at a cost of $35,000.

Cleveland, O.—J. Milton Dyer, Cuyahoga Bldg., is stated to have completed preliminary plans for the city hall to be erected here.

Bucyrus, O.—It is stated that bids will be received until July 12 by the Bd. Pub. Safety for erecting an engine house. Chas. R. Weatherhogg, Archt., Ft. Wayne, Ind.

Mangum, Okla. Ter.—It is reported that bids are wanted until July 20 for erecting a courthouse. Floyd McNeil, Co. Clk.

Ft. Stevens, Ore.—The following are the bids opened on June 17 by Capt. Goodale, Q. M., U. S. A., Astoria, (*a*) for the construction of a wharf and approach and a boat house at Ft. Stevens (bidders all of Astoria); (*a*) totals with creosote treatment; (*b*) totals without creosote treatment): Ferguson & Houston, *a* $19,634, *b* $8,434; L. Lebeck, *a* $14,000, *b* 9,210; John Mattson, *a* $25,050, *b* $9,600; J. A. Fastabend, $19,750, *b* $8,600.

The following are the bids opened June 16 for installing heating systems in 2 barracks and 6 officers' quarters at Ft. Stevens; Theo. M. Barr, Salem, $18,928; Ferguson & Houston, Astoria, $25,180, and W. C. Laws & Co., Astoria, $20,321.

Harrisburg, Pa.—Lynch Bros. are stated to have submitted the lowest bid, $60,038, on revised plans by Philip H. Johnson for 4 temporary ward buildings at the State Hospital for the Insane. The buildings will be of frame, one story high, each measuring 40x200 ft.

Reading, Pa.—Wm. A. Fink, of Reading, has prepared plans for a Hospital to be erected here at a cost of about $75,000. Address Dr. Shollenberger, Homeopathic Hospital.

**Newport, R. I.*—Darling & Slade, Fall River, Mass., are stated to have received the contract (bids opened June 8) for erecting a fireproof building at the Torpedo Station near here, for the storage of torpedo boat supplies, at $29,950.

**Ft. Moultrie, S. C.*—The contract for erecting a post exchange and gymnasium at Ft. Moultrie is reported to have been awarded to Simons-Mayrant Co., of Charleston, for $20,447.

**Centerville, Tenn.*—The Pauly Jail Bldg. Co., of St. Louis, Mo., is stated to have received the contract for erecting a jail for Hickman County for $13,400.

Midland, Tex.—The citizens are stated to have voted to issue $30,000 bonds for erecting a courthouse in Midland County.

Olympia, Wash.—The contract for erecting the School for Defective Youth building at Medical Lake and ward hospital building at the Eastern Washington Hospital for the Insane will be awarded to Hastie & Dougan, of Tacoma, according to reports.

*Heating contracts are stated to have been awarded as follows: Ward hospital, Rautman Plumbing & Heating Co., Seattle, $4,603; School for Defective Youth, Seattle Heating & Plumbing Co., $5,147; plumbing hospital, M. Isbister, Spokane, $2,592; school, G. H. Brown & Co., Seattle, $2,570.

Ft. Wright, Wash.—The following are the bids opened on June 15 by Capt. E. A. Shuttleworth, Constr. Q. M., U. S. A., for construction, etc., of buildings at this post:

Construction complete, including plumbing, heating and electric wiring: McInnist & Reed, Portland, Ore., $225,586; J. E. Bonnell, Tacoma, $249,254; Bringham & Hoska, Seattle, $218,677; Hastie & Dougan, Spokane, $227,171; Burrell Constr. Co., Oakland, Cal., $237,156; Weber & Groshoff, Spokane, $240,569.

Construction only: A. & J. McDonald, Salt Lake City, Utah, $195,788, and Erb & Van Patten, Salem, Ore., $184,095.

Plumbing and heating: G. A. Kees Eng. Co., St. Paul, Minn., $35,989; Dwyer Plumbing & Htg. Co., St. Paul, Minn., $39,729; Robt. Dalziel, Jr., Oakland, Cal., $36,182; Healy Plumbing & Htg. Co., St. Paul, Minn., $37,600, and Arnold Evans & Co., Spokane, $41,300; R. C. McCaffrey, Spokane, plumbing only, $22,839.

Electric wiring: W. E. Chase. Eng. Co., Spokane, $4,275; Bergren Electric Co., St. Paul, Minn., $3,500, and McBride Electric Co., $4,075.

Bids will be received until July 6 by Capt. Ed. A. Shuttleworth, Constr. Q. M., U. S. A., for constructing, heating, plumbing and electric wiring 2 double barrack buildings here.

Bremerton, Wash.—Bids will be received until Aug. 5 by Mordecai T. Endicott, Ch. Bureau Yards and Docks, Washington, D. C., for constructing an extension of the joiner shop at the navy yard, Puget Sound, Wash.; appropriation available, $20,000. Plans and specifications may be secured upon a deposit of $5.

Milwaukee, Wis.—See "Bridges."

Toronto, Ont.—Bids will be received until July 4 by the Bd. Control (Mayor Thos. Urquhart, Chmn.) for erecting a shelter at Island Park.

BUSINESS BUILDINGS.

See also Business Buildings.

Mobile, Ala.—See "Railroads."

Palo Alto, Cal.—The Free Masons of Palo Alto are stated to have decided to erect a temple at University Ave. and Florence St., plans having been prepared for the same.

San Francisco, Cal.—Plans are stated to have been prepared by Wright & Polk, 124 Sansome St., for the erection of a 7-story 50x170 ft. building at Market and 8th Sts., for Bare Bros; estimated cost, $120,000.

Denver, Colo.—The warehouse of the Ayres Mercantile Co. at 6th and Wynkoop Sts. is reported to have been destroyed by fire.

Denver, Col.—F. E. Edbrooke, 510 Opera House Blk., is stated to have prepared plans for a 6-story office building to be erected for Bennett & Myers at 15th and Stout Sts., to cost $130,000.

E. P. Varian, Taber Blk., has prepared plans for a 3-story family hotel for Wm. Ashbaugh to cost $75,000.

Washington, D. C.—The Washington Post Co. is stated to have decided to erect an addition to its present building at 1335 E St., N. W., adjoining that structure on the east, and costing approximately $29,000.

Jacksonville, Fla.—It is stated that Stockton & Budd will erect a 6-story office building on Forsyth St.

W. B. Dawson is reported to have decided to erect a 4-story office building at Forsyth and Hogan Sts.

**Augusta, Ga.*—T. O. Brown is stated to have received the contract for erecting a warehouse for the Atlantic States Warehousing Co. for $49,000.

**Peoria, Ill.*—The contract for erecting a 4-story warehouse on Washington St. for Schipper & Block is stated to have been awarded to Valentine Jobst & Son for $22,000.

Chicago, Ill.—It is stated that the Chicago & Western Indiana R. R. Co. (J. M. Warner, Supt.) will erect a station at 47th St., to cost $50,000; also one at 57th St., to cost $20,000.

Peru, Ind.—Grapsey & Lamb are reported to have completed plans for a 3-story 133x118 ft. building to be erected at Peru for McCafery & Sullivan, at a cost of $500,000.

Indianapolis, Ind.—It is stated that bids are wanted until July 10 for erecting a building for the Grand Lodge of Indiana, Knights of Pythias, at Pennsylvania St. and Massachusetts Ave.; probable cost, $300,000. J. F. Alexander & Son, Archts., Lafayette.

**Peru, Ind.*—J. B. Goodall is stated to have secured the contract for erecting a 3-story brick building for Bearss & Sullivan at $60,000.

Kokomo, Ind.—It is reported that bids will be received until July 5 by J. F. Bruff, Archt., Kokomo, for erecting a brick business building for J. C. Blacklege.

Muskogee, Ind. Ter.—A permit is stated to have been granted to the Missouri, Kansas & Texas R. R. Co. for the erection of a warehouse and offices on B'way. The structure will be of brick, 150x40 ft., 2-story high and cost $75,000.

**Cedar Rapids, Ia.*—The Barnett & Record Co., Corn Exchange Bldg., Minneapolis, Minn., is stated to have received the contract for rebuilding the mill of the American Cereal Co. for $700,000.

**Sioux City, Ia.*—Ostling & Johnson are stated to have received the contract for alterations to the building of the Davidson Bros. Co. for about $40,000.

Topeka, Kan.—It is stated that Geo. A. Miller contemplates erecting a theater here, to cost $25,000.

**Topeka, Kan.*—T. M. Spencer is stated to have received the contract for erecting the Y. M. C. A. building, for $47,900.

Louisville, Ky.—The Jefferson Market & Storage Co. will erect a market house on Jefferson and Brook Sts., to cost about $40,000.

J. B. Speed will erect a skyscraper with arcades for retail stores and offices above.

Henderson, Ky.—The freight house of the Louisville & Nashville R. R. Co. (W. H. Courtenay, Ch. Eng., Louisville) is reported destroyed by fire.

Baltimore, Md.—T. B. Ghequier is stated to have prepared plans for a 4-story brick building to be erected at Paul and Fayette Sts. for J. M. Berry & Son.

Kalamazoo, Mich.—It is stated that plans are being prepared for a 5-story 165x70 ft. brick hotel to be erected here at a cost of $125,000. Edward Blackall is reported interested.

Minneapolis, Minn.—The Nurty Simmons Hardware Co. is stated to have decided to erect a building at a cost of $200,000.

Mankato, Minn.—H. C. Gerlach is reported to have been selected to prepare plans for a 4-story, 76x130-ft. building to be erected by Lamm & Landkamer.

**St. Paul, Minn.*—Geo. J. Grant is stated to have secured the contract for erecting a 9-story brick and stone fire-proof warehouse for Farwell, Oznum & Kirk to cost about $500,000.

*The P. M. Hennessy Constr. Co., N. Y. Life Bldg., is stated to have secured the contract for erecting a brick warehouse and office building on Eagle St. for the Val Blatz Brewing Co., for about $20,000.

Butte, Mont.—The Silver Bow Club is reported to have under consideration the erection of a building here, at a probable cost of $125,000.

**Omaha, Neb.*—Olsen & Jensen are stated to have secured the contract for erecting a warehouse at 8th and Douglas Sts. for the Val. Blatz Brewing Co. for $25,000.

New York, N. Y.—It is stated that the Grand Lodge of Free Sons of Israel are considering the erection of a clubhouse.

Minot, N. D.—The Masonic Temple Association is stated to have under consideration the erection of a 2-story, 50x100-ft., brick building for lodge purposes.

**McKeesport, Pa.*—Bueck Bros. are stated to have received the contract for erecting the White Hotel for $60,000.

Philadelphia, Pa.—Plans have been filed by Wm. Steele & Sons, 1600 Arch St., for a 3-story brick stable, to be erected at 2138 Lombard St., at a cost of $20,000.

Nashville, Tenn.—The department store occupied by Harris Bros. & Jacobus Bros. at 5th Ave. and Union St., is reported destroyed by fire.

Johnson City, Tenn.—The Southern Ry. Co. is stated to have had plans prepared for a passenger station to be erected here. W. H. Wells, Engr. of Construction, Washington, D. C.

Chattanooga, Tenn.—The Independent Order of Odd Fellows is stated to have purchased a site at A and 10th Sts. for the erection of a building to cost about $40,000.

**Dallas, Tex.*—Archts. Sanguinet & Staats, of Dallas, writes that the contrast for erecting the 5-story brick and stone M. P. Exline Bldg. (bids opened June 14) has been awarded to D. C. McCord, of Dallas.

**Items marked thus give the names of parties awarded contracts.*

Richmond, Va.—The Odd Fellows of Richmond are stated to have under consideration the erection of a temple at First and Broad Sts.; probable cost, $100,000.

Spokane, Wash.—Fairbanks, Morse & Co. are stated to have selected J. K. Dow, 518 Peyton Bldg., to prepare plans for a warehouse to be erected at Spokane; probable cost, $20,000.

Wheeling, W. Va.—The Scottish Rite Masons are stated to have purchased a site at Byron and 14th Sts. for the erection of a cathedral.

**Milwaukee, Wis.*—The following bids are stated to have been received for erecting the amphitheater at the State Fair Park: D. B. Danielson, of Milwaukee, $44,473 (awarded contract); Chas. Luenzmann & Co., $54,475, and Henry Ferge, $56,533.

**Milwaukee, Wis.*—Paul Reisen and John Deblink are stated to have received the contracts for mason and carpenter work on the hide house to be erected for the Pfister & Vogel Leather Co. at the Bay View Plant. The building is to be of brick and cost $30,000.

Evanston, Wyo.—The roundhouse of the Union Pacific Ry. Co. (J. B. Berry, Ch. Engr., Omaha, Neb.) is reported to have been destroyed by fire.

NEW YORK, N. Y.

Hudson and N. Moore Sts., 6-story br. and stone store and factory; c, $40,000; o, Ida May Powell and S. J. Volk; a, Meuri Fouchaux.

270 Bway, 4-story br. and stone bank bldg.; c, $350,000; o, Chemical National Bank; a, Trowbridge & Livingston.

349 E. 113th St., 6-story br. and stone store and tenement; c, $50,000; o, Raphael Kurzrok; a, Horenburger & Straub.

126th St. and 3d Ave., 3-story br. and stone loft bldg.; c, $40,000; o, Otto Stahl; a, A. G. Koenig.

135th St. and Lenox Ave., 10 6-story br. and stone stores and tenements; total c, $420,000; o, Shapf & Silverson; a, Geo. F. Pelham.

Park Ave. and 176th St., 3-story br. stable; c, $20,000; o, Tremont Fireproof Warehouse Co.; a, John E. Kerby.

176th St. and Park Ave., 8-story br. storage warehouse; c, $100,000; o, Tremont Fireproof Storage Warehouse Co.; a, John E. Kerby.

Webster Ave. and City Line, 2-story br. stables; c, $40,000; o, R. H. Macy & Co.; a, Delemos & Cordes.

111 E. 56th St., alterations to 4-story br. and stone studio bldg.; c, $20,000; o, Cornelius Poillon.

2100 Bway, alterations to a 4-story br. and stone offices and studios; c, $50,000; o, Jas. Butler and Peter McDonnelly; a, Maynicke & Franke.

318 4th Ave., 11-story br. extension to 11-story br. and stone store and office bldg.; c, $400,000; o, Metropolitan Life Insurance Co.; a, N. Le Brun & Sons.

CHURCHES AND DWELLINGS.

Notes Arranged Alphabetically by States.

Denver, Colo.—Boal & Harnois, 100 E. 16th Ave., have prepared plans for a 2-story brick residence for Crawford Hill, to be erected at 963 Grand St., to cost $40,000.

Decatur, Ill.—The Grace M. E. Society is stated to have accepted plans for the erection of an edifice to cost $40,000.

Chicago, Ill.—It is stated that the Congregation of Sacramento Ave. M. E. Church will rebuild the edifice at Sacramento Ave. and W. Adams St., at a cost of $20,000.

Howard Shaw, 175 Dearborn St., is stated to have prepared plans for a 7-story 80x100 ft. brick building to be erected at 129 Clinton St.; also plans for an 8-story 75x175 ft. brick building for Albaugh Bros. & Dover to be erected at W. 21st St. and Marshal Boule., at a cost of $110,000.

Plans are reported to have been prepared by Turnock & Ohrenstein, 76 5th Ave., for the erection of a 3-story 62x100 ft. apartment, to be erected at 4143 Alexander Pl., at a cost of $46,000.

Worcester, Mass.—Frost, Briggs & Chamberlain, 518 Main St., have prepared plans for a $15,000 dwelling for Chandler Bullock.

Minneapolis, Minn.—A permit is stated to have been granted for the erection of a 70x110 ft. brick residence on Groveland Ave. for W. H. Dunwoody, at a cost of $40,000.

St. Paul, Minn.—A permit has been issued for a stone and brick edifice to be erected on Albermarle and Ross Sts., for the congregation of St. Bernards R. C. Church, to cost $100,000. Contractor Geo. J. Grant.

St. Joseph, Mo.—It is stated that the First Presbyterian Society has under consideration the erection of an edifice to cost $25,000.

Newark, N. J.—The Forest Hill Presbyterian Society is stated to have received a donation of $30,000 toward the erection of church to cost $50,000.

Cincinnati, O.—It is stated that plans are being prepared by Rapp, Zettle & Rapp, Johnson Bldg., for the erection of a 4-story building to be erected at Erie Ave. and Edward St. for Otto Betz, at a cost of $30,000.

Houston, Tex.—It is stated that plans have been been prepared for the erection of a Jewish Synagogue at Rusk Ave. and Jackson St., to cost about $40,000.

Salt Lake City, Utah.—The First Methodist Church will erect an edifice 80x125 ft., with tower 115 ft. high; probable cost, $50,000. Architect, F. Hale, Commercial Bldg.

NEW YORK, N. Y.

12th St. and Ave. B, 2 6-story br. and stone tenemts.; total c, $50,000; o, Maria Wimpie; a, Bernstein & Bernstein.

34 E. 52d St., 5-story br. and stone dwell.; c, $40,000; o, Robt. H. McCurdy; a, Clinton & Russell.

33 W. 53d St., 6-story br. and stone dwell.; c, $60,000; o, Archibald Rogers; a, Robertson & Potter.

235 E. 105th St., 6-story br. and stone tenemt.; c, $32,000; o, Siegel & Lipman; a, Ed. A. Myers.

Ave. A and 72d St., 6-story br. and stone tenemt.; c, $42,000; o, Morris Okun; a, Brown & Timendorfer.

Park Ave. and 114th St., 6-story br. and stone tenemt.; c, $40,000; o, Hyman Levin; a, Bernstein & Bernstein.

44 W. 96th St., 6-story br. and stone tenemt.; c, $50,000; o, L. W. and E. Morrison; a, Dehli & Howard.

175th St. and Washington Ave., 2 5-story br. tenemts.; total c, $60,000; o, Thos. F. Mulligan; a, John Kennedy.

176th St. and Washington Ave., 5-story br. tenemt.; c, $65,000; o, Sommer Constr. Co.; a, Moore & Landsiedel.

Bainbridge Ave. and College Pl., 3 3-story br. dwells.; total c, $21,000; o, Wm. C. Bergen; a, Chas. S. Clark.

Boston Rd. and 166th St., 4 5-story br. tenemts.; total c, $160,000; o, Triboro Realty & Constr. Co.; a, Benj. W. Leviton.

Grant Ave. and 163d St., 5 3-story br. dwells.; total c, $50,000; o, Wm. E. Diller; a, G. A. Schellenger.

Longwood Ave. and Fox St., 5 5-story br. tenemts.; total c, $270,000; o, Daily & Carlson; a, Neville & Bagge.

Union Ave. and Horne St., 5-story br. tenemt.; c, $50,000; o, Rosenthal & Co.; a, Moore & Landsiedel.

101st St. and Bway, 6-story br. and stone tenemt.; c, $130,000; o and a, Alonzo B. Kight.

111st St. and Manhattan Ave., 4 6-story br. and stone tenemts.; total c, $160,000; o, Harry Schiff; a, Fred F. Pelham.

128th St. and Lenox Ave., 2 6-story br. and stone tenemts.; total c, $60,000; o, Lesowitz & Kaufman; a, B. W. Levitan.

171st St. and Audubon Ave., 2 5-story br. and stone tenemts.; total c, $80,000; o, David C. Kee; a, Henri Fouchaux.

Audubon Ave. and 178th St., 3 5-story br. and stone tenemts.; total c, $145,000; o, Ravekes & Levington; a, Lorenz F. J. Weiher.

139th St. and Brook Ave., 9 6-story br. tenemts.; total c, $360,000; o, Steinman Realty Co.; a, Geo. F. Pelham.

155th St. and Courtland Ave., 5-story br. tenemt.; c, $40,000; o, H. T. Bulman; a, M. J. Garvin.

SCHOOLS.

Notes Arranged Alphabetically by States.

Fayetteville, Ark.—It is reported that plans and specifications will be received until July 15 by the Bldg. Com. (F. P. Clark, Clk.) for erecting 6 buildings at the University of Arkansas; probable cost, $77,500.

Pine Bluff, Ark.—It is stated that a high school will be erected here at a cost of $50,000.

San Diego, Cal.—The City Bd. of Education is stated to have recommended the erection of a high school, to cost about $100,000.

Ansonia, Conn.—Bids will be received until July 17 by the City Clk. for $70 000 school bonds.

Columbus, Ga.—Bids will be received until July 17 by the Bldg. Com. Bd. Educ. (C. E. Morris, Chmn.) for furnishing materials and erecting two 4-room annexes, 1 to the Northwood School and 1 to the 8th Ave. School; David Riebel, Archt., Eberly Bldg.

**Quincy, Ill.*—The contract for erecting the Berrian School is stated to have been awarded to W. F. Odor, of Canton, Mo., for $50,000.

Chicago, Ill.—The Sisters of the Congregation of Notre Dame are stated to have decided to erect a school at 113th and State Sts., West Pullman, J. T. Fortin, New Era Bldg., having prepared plans for the same. The structure is to be 3 stories, brick, 100x90 ft. and cost $50,000.

Bloomington, Ind.—It is reported that bids will be received Aug. 9 by the Bd. Trus. Indiana Univ. for erecting a library; probable cost, $100,000.

Indianapolis, Ind.—It is reported that bids will be received until July 11 by the School Bd. (John E. Cleland, Bus. Dir.) for erecting an addition to Public School No. 18; Clarence Martindale, Archt., Indiana Trust Bldg.

Vincennes, Ind.—It is reported that bids will be received until July 5 by W. M. Reel, Trus., Palmyra Township, for erecting a school in Dist. No. 10.

Muskogee, Ind. Ter.—It is stated that plans are being prepared for a high school to be erected here. According to reports, an election will be held to vote on $75,000 bonds for additinal school buildings.

Morning Sun, Ia.—Plans are stated to have been accepted for the erection of a high school, to cost $20,000.

It is stated that bids will be received until July 24 by the School Bd. (J. K. Latta, Secy.) for furnishing materials and erecting a school.

Swampscott, Mass.—The following bids are stated to have been received for erecting the Clarke School at Middlesex and Norfolk Aves.: E. T. Reynolds, Lynn, $23,450 (awarded contract); J. A. Healey, $23,696; P. H. Jackson, $24,458; Titus & Poor, $25,000; C. S. Cunningham, $25,300.

Holyoke, Mass.—Press reports state that bids will be received until July 14 by the Bd. Pub. Wks. for erecting a 16-room school in South Holyoke; probable cost, $60,000.

Pontiac, Mich.—The Bd. Educ., Union School Dist. (Harry H. Snowdon, Secy.) will receive bids until July 6 for erecting a 10-room basement and 2 story brick school; Fisher Bros., Archts., Pontiac.

Ann Arbor, Mich.—It is stated that the Univ. of Michigan will erect a memorial building at a cost of $100,000.

Grand Rapids, Mich.—The erection of a school in the vicinity of Wealthy Ave. and Fuller St. is reported to have been decided upon; estimated cost, $24,000.

South St. Paul, Minn.—All bids received for erecting the school here are stated to have been rejected. According to reports, new bids will be received.

**Stephen, Minn.*—Geo. Morian, of Stephen, is stated to have received the contract for erecting a high school here for $18,050.

**Columbia, Miss.*—The contract for erecting a building for the high school is stated to have been awarded to G. T. Hallas Co. for $24,300.

Lexington, Miss.—Bids will be received July 11 by the School Bd. (R. E. Wilburn, Clk.) for plumbing the Lexington School; R. H. Hunt, Archt., Chattanooga, Tenn.

St. Louis, Mo.—The following are reported to be the lowest bids received for erecting an addition to the Howard School: T. W. Hackett, construction, $32,405; John Clark, plumbing,, $4,274; Sodemann Heating and Plumbing Co., for heating and ventilating, $6,982.

**Dillon, Mont.*—Archt. C. S. Haire, of Helena, writes that the contract for erecting a normal school at Dillon (bids opened June 20) has been awarded to Edw. Wagner, of Dillon, for $45,000, not including heating and plumbing.

Newark, N. J.—Bids will be received until July 6 by the Com. on School Houses, Bd. Educ., (R. D. Argue, Secy.) for furnishing materials and doing the mason work required in erecting the Avon Ave. School. Chas. P. Baldwin, Archt., 45 Clinton St.

**Jersey City, N. J.*—Fred Ege, Secy. Bd. Educ., writes that contracts for alterations to School No. 6 (bids opened June 22) have been awarded as follows: Chas. Kuederly, 319 Communipaw Ave., mason work, $14,977; Thos. Mahoney, 196 Morgan St., carpenter work, $9,779; Martin A. H. Miller, 201 Griffith St., painting, $3,177. Heatherton Bros., 665 Ocean Ave., plumbing and gas fitting, $1,896, and John T. McLaughlin, corner York and Greene St., ventilating and heating, $4,033.

Manchester, N. H.—It is stated that plans have been asked for a $30,000 school. The Mayor is Chairman of Com.

New York, N. Y.—The following are the bids opened June 26 by C. B. J. Snyder, Supt. School Bldgs., for general construction, etc., of additions to and alterations in Public School 71, Boro. of Manhattan: Lincoln & Ranney, 460 West 41st St., $52,422; Wm. Werner, 894 Forest Ave., Bronx Boro., $51,672; P. Gallagher, $55,643; J. & L. Moreland Co., $57,300; John P. Nugent, $55,000; Edmund D. Broderick, $54,900; Tolmie & Kerr, $52,687; Thos. Cockerill & Son, $59,800; Thos. McKeown, $55,500, and Pat'k Sullivan. $52,700.

**Long Island City, L. I., N. Y.*—The following are the bids opened June 26 by C. B. J. Snyder, Supt. School Bldgs., N. Y. City, for installing ventilating and heating apparatus in addition to Public School 71, Boro. of Queens: E. Rutzler Co., $20,293; Walker & Chambers, $20,555, and Frank Dobson, 218 E. 42d St., New York City, $19,970 (awarded contract).

Whitestone, L. I., N. Y.—Bids will be received July 10 by C. B. J. Snyder, Supt. School Blids., New York City, for alterations, etc., of School No. 30, Boro. Queens.

Albion, N. Y.—The citizens are stated to have voted to issue $75,000 bonds for erecting a high school here.

Bottineau, N. D.—David Clark, Chmn. School of Forestry, writes that it is proposed to erect a building here to cost $30,000. Architect, J. B. De Remer, of Grand Forks.

**Watertown, N. Y.*—The Bd. of Education is stated to have on June 20 awarded the contract for installing a heating and ventilating system in Mead St. School to the Pease & Howard Co., of Syracuse, for $2,944.

Troy, N. Y.—The plan of Demers & Campaigne Ilium Bldg is stated to have been accepted for the Broadway approach to the proposed new building of the Rensselaer Polytechnic Institute. The plans provide for granite steps, etc.; estimated cost, $38,000.

Schenectady, N. Y.—The Bd. of Trus. of Union College are stated to have decided to expend $25,000 or more for the erection of an engineering building and the enlargement of present laboratory.

**Canandaigua, N. Y.*—The Bd. of Education is stated to have awarded on June 12 the contracts for erecting heating and ventilating the high school, J. E. Leamy & Co., of Syracuse, having secured the contract for construction at $69,732, and Breen Bros., of Utica, the ventilating and heating contract for $11,343.

Louisburg, N. C.—Bids will be received until July 5 by the Bd. Graded School Trus. (Wm. H. Ruffin, Secy.) for erecting a brick graded school; Wheeler, Runge & Dickey, Archts., Charlotte.

Ft. Totten, N. D.—Bids will be received until July 27 by the Comr. Indian Affairs, Dept. Interior, Washington, D. C., for furnishing materials to construct and complete 3 day schools and 3 employee quarters for day schools on the Turtle Mountain Reservation; for further information address Chas. L. Davis, Supt., Ft. Totten, N. D.

Ironton, O.—It is stated that bids will be received until July 12 by the Bd. Pub. Safety for erecting an engine Ogg, Clk.) to complete the ventilating and heating system for Kingsbury School.

Harshman, O.—It is stated that bids will be received until July 17 by the Bd. Educ. (Otto Gernin, Clk.) for erecting a school in Sub-Dist. No. 1.

Youngstown, O.—It is reported that bids will be received July 18 by the School Bd. (W. N. Ashbaugh, Clk.) for erecting a 10-story school on Myrtle Ave.

Georgesville, O.—Press reports state that bids will be received until July 12 by the Bd. Educ. (J. E. Holland, Clk.) for erecting a school in Pleasant Township.

Elyria, O.—The following bids are stated to have been received June 19 for erecting the 6th St. School: John Kiatt, Lorain, $30,900; Fred C. Wolf, $29,575; Wentz & Co., Canal Dover, $30,528; H. A. Beck, $34,462; J. Kaiser & Bro., $29,924, and Philip Myers, $30,092 (bidders all of Elyria unless otherwise mentioned).

Lancaster, O.—Bids will be received until July 19 by Col. C. B. Adams, Supt. Boys' Industrial School, for erecting a cottage; Richard, McCarty & Bulford, Archts., Columbus.

Fremont, O.—Bids will be received July 12 by the Bd. Educ., Sandusky Township, John Miarer, Clk.) for erecting a brick school in sub-dist. No. 9.

Cleveland Heights, O.—Bids will be received until July 6 by the Bd. Educ. (Wm. G. Phare, Clk., 402 Am. Trust Bldg., Cleveland) for furnishing materials and erecting a 4-room brick school on Roxboro Road; Geo. F. Hammond, Archt., 166 Euclid Ave., Cleveland; also July 17 for furnishing materials and installing plumbing and sewers in the East Madison, Lowinski and Fairmount schools.

Slippery, Rock, Pa.—Plans are stated to have been accepted for the erection of a brick building 100x138 ft. for a gymnasium and music hall for the Slippery Rock State Normal School, probable cost $50,000.

Philadelphia, Pa.—Plans have been filed by the E. F. Fonder Co., 1116 Land Title Bldg., for the erection of a 3-story stone school at 32d and Berks Sts. for $62,000.

Providence, R. I.—The Common Council is stated to have passed over the Mayor's veto the resolution providing for the appropriation of $150,000 for alterations to the Technical High School.

Memphis, Tenn.—Jones & Furbringer are stated to have prepared plans for the Idlewild and Chelsea schools. The

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**Items marked thus give the names of parties awarded contracts.*

buildings are to be 2 stories high, of brick and cost $25,000 each.

El Paso, Tex.—J. J. Barr is stated to have received the contract for erecting a school here for $33,200.

Alice, Tex.—Bids will be received until July 11 by the Bd. Trus., Independent School Dist. (F. B. Nayer, Pres.) for furnishing materials and erecting an 8-room, brick school. Plans and specifications may be had upon deposit of $25 if same are returned within one week.

**San Angelo, Tex.*—The Bd. of Trus. are stated to have on June 5 awarded the contract for erecting the 2-story brick high school to Z. D. Gafford, of San Angelo, for $22,136.

Milwaukee, Wis.—See "Bridges."

Platteville, Wis.—The Legislature has passed the bill providing for an appropriation of $100,000 for the erection of a normal school in Platteville.

Elm Grove, W. Va.—It is stated that the contract will soon be let for the erection of a building here for the Catholic Industrial School, at a cost of $40,000.

Milwaukee, Wis.—The following are reported to be the lowest bids received by the Bd. of Pub. Wks. June 23 for furnishing material and erecting North Division High School at Center and 11th Sts.: W. F. Duke, masonry, $38,903; Fred Poetsch, cast iron and steel work, $22,175; C. W. McNally, heating and ventilating, $14,688; C. F. Kindt, carpenter work, $20.294.

The Legislature has passed a bill providing for the appropriation of $185,000 for erection of the normal school here.

NEW INDUSTRIAL PLANTS.

Notes Arranged Alphabetically by States.

Couple-Gear-Freight-Wheel Co., Grand Rapids, Mich., will shortly begin building a plant for the manufacture of electric trucks. The new building will be 198x48 ft. and will have connected with it shipping room, boiler and engine room and blacksmith shop. About 75 to 100 h.p. will be required to operate the plant.

Eastman (Ga.) Cotton Mills is now erecting an extension to its plant. New machinery will be installed and plant will be ready for operation about Oct. 1, 1905.

The German-American Co., Spray, N. C., are reported to be in the market for a second-hand, 600-h.p. engine.

Tennessee Land & Iron Co., Dickson, Tenn., will shortly issue $350,000 in 5 per cent. bonds for the development of its iron and phosphate mines and the erection of a 100-ton blast furnace. The company will install an ore washer and build 6 miles of railroad.

La Crosse (Wis.) Rubber Mills Co. contemplates increasing its plant by the addition of new machinery.

The Morden Frog & Crossing Works, The Rookery, Chicago, Ill., have not yet ordered the power plant for their new plant at Chicago Heights, plans for which are being prepared. The plant will cover a floor space of about 180,000 sq. ft.

The Edwards Electric Headlight Co., 417 Monadnock Bldg., Chicago, Ill., will probably add to its present quarters in the course of a few months.

Kreis & Monday, Knoxville, Tenn., will erect a $15,000 marble plant, according to local newspaper reports.

Contract for a 5-story, 58x88-ft. malthouse for the American Malting Co., at 123d St. and Western Indiana tracks, Chicago, Ill., to cost $100,000, has been let to W. M. Crilly, according to local newspaper reports.

The Union Stopper Co., Morgantown, W. Va., has let contract to the Canton Bridge Co. for iron for an 80x100-ft. furnace building, according to local newspaper reports.

I. F. McLean, Nashville, Tenn., will erect a stave and heading plant, with several sawmills and lumber plants in connection with it, which will represent an investment of about $100,000, according to local newspaper reports.

The Kee Lox Co., Rochester, N. Y., according to local newspaper reports, has purchased property in Benson Park measuring 230x168 ft. Plans have been drawn for a 162x55-ft. building. This building will be used for the manufacture of typewriter ribbons and carbon paper. The contract has been awarded to Denniston & Co., the cost involved being about $20,000.

The Rockford (Ill.) Match & Machine Mfg. Co. has been organized for the purpose of manufacturing matches and match machinery and will build a new factory which will have a capacity of 1,000 gross of matches per day. There will also be erected a machine shop for the manufacture of match machinery.

The G. A. Welty Co., Zanesville, O., manufacturers of work shirts, is having erected a new plant, to be operated by water power.

East Tenessee Mining & Smelting Co., Fall Branch, Tenn., has recently built a concentrating plant having a daily capacity of 100 tons zinc blende. The main building is 30x80, 25 ft. high; engine and boiler house, 30x50 ft. Additional buildings will be added as needed. This company also contemplates erecting a smelting plant in the near future.

Bravman & Co., Wilkesbarre, Pa., manufacturers of bedding and feather pillows, are adding a new building to their plant which will be 25x77 ft. and four stories high. The new building will be constructed of brick, stone and iron. The power required to run the plant will be 15 h.p. A large boiler will be installed for heating, and the company is in the market for belting.

The Landis Machine Co., Waynesboro, Pa., is at present building a 115x80-ft. addition to its machine shop. The company will install considerable new machinery and contemplates doubling its output by this addition to the plant. They are also erecting a new office building.

A. Kory & Son, New Orleans, La., according to local newspaper reports, will erect a large factory building, to cost between $60,000 and $75,000. Plans are being prepared by Thomas Sully, of New Orleans.

The National Acme Mfg. Co., Cleveland, O., according to local newspaper reports, will erect a new factory building, 40x82 ft., contract having been awarded to D. C. Griese & Walker Co.

German-American Button Co., Rochester, N. Y., is having plans prepared for a large addition to its manufacturing plant, to consist of a number of buildings, according to local newspaper reports.

E. R. Thomas Motor Co., Buffalo, N. Y., has just begun the erection of a new plant, to be 400x50 ft. and three or four stories high. The construction will be of concrete and glass, and the power required will amount to about 150 h.p. The company expects to occupy the new building about Oct. 1 next.

The Allis-Chalmers Co. has begun the great extensions to its already large works at West Allis, Milwaukee. The company has awarded to James Stewart & Co., of Pittsburg, the contract for acting as supervising engineers and managers of construction for the entire undertaking. The American Bridge Co. of New York has secured the contract for the structural steel, erected in place, for three of the new buildings, a contract which calls for approximately 6,800 tons of steel. The Riter-Conley Mfg. Co., of Pittsburg, has been awarded the contract for the structural steel, erected in place, for the foundry and pattern storage buildings and erecting shops, comprising approximately 4,000 tons of steel. All the structural steel for the new Allis-Chalmers Works is to be delivered and erected within 23 weeks from the date of the signing of the contract, and the company expects to occupy its new works by or before next March. Some idea of the size of the works when extended will be afforded by the fact that the company's present floor space at West Allis, Milwaukee, has a total area of 652,000 sq. ft., and with the new extensions upon which work is now in progress will add 861,000 sq. ft., or more than double the present capacity. The plant will be capable of affording employment for 11,000 persons. Thus, in addition to the capacity of the other works of the company in Milwaukee, Chicago, Cincinnati and Scranton, it will bring up the total number employed to the aggregate of 18,000 persons.

F. J. Lewis Mfg. Co., Rock Island, Ill., makers of building paper and coal tar products, is at present increasing its plant by the addition of two buildings, size 50x140 and 64x160. This concern is in the market for a boiler, shafting and cooperage machinery.

Craggy Mountain Extract Co., Asheville, N. C., has recently been organized for the manufacture of tannic acid from chestnut wood. The company proposes shortly to build a plant having a capacity of 60 bbl. per day.

Northern Aluminum Co., Ltd., is making extensive additions to its plant at Shawinigan Falls, Quebec, Can.

Whitcomb Mfg. Co., P. Blaisdell & Co. and Whitcomb Foundry Co., all of Worcester, Mass., have recently been merged into one corporation, known as the Whitcomb-Blaisdell Machine Tool Co., according to local newspaper reports. The new corporation has a capitalization of $200,000 and has lately acquired a large tract of land, on which new buildings will be erected.

The Russell Wheel & Fdy. Co., Detroit, Mich., will shortly begin the construction of two one-story, brick, steel factories, at a cost of $20,000, according to local newspaper reports.

It is reported that the United States Steel Corporation is contemplating building at Clairton, Pa., a new rod, wire and nail mill.

The Duncan (I. T.) Cotton Oil Co. has recently been organized and is now planning the erection of a large plant, according to local newspaper reports.

Richmond Hosiery Co., East Chattanooga, Tenn., is planning to erect a new mill which will have a capacity of 5,000 spindles, according to local newspaper reports. The new buildings and machinery will cost about $100,000.

Baker Motor Vehicle Co., Cleveland, O., will begin immediately the erection of an addition to their plant which will have a capacity of about three times that of the old plant, according to local newspaper reports. The new plant with its equipment will cost about $200,000. The general contract has been let to Geo. B. McMillan.

Application has been made for charter for the incorporation of the Hays-Henderson Saw & Supply Co., Chattanooga, Tenn., according to newspaper reports. The new company will be capitalized at $25,000 and will manufacture inserted tooth saws, planing knives, bits, etc. A site has already been purchased for the erection of a $10,000 plant.

MISCELLANEOUS.

Notes Arranged Alphabetically by States.

**Nome, Alaska.*—Capt. E. W. Johnston, of Seattle, Wash., is reported to have secured the contract for the construction of a harbor at Nome. According to the agreement between Capt. Johnston and the Nome Improv. Co., the sum of $250,000 is to [illegible] expended in the next 18 months. It will be done under the authority of the rivers and harbors bill passed by the last Congress. The U. S. Engr. Corps will have supervision. A separate contract was made between the company and Capt. Johnston for the erection of piers and the reclamation of tidelands, where large warehouses are to be built.

**West Memphis, Ark.*—H. N. Pharr. of Memphis, Tenn., Ch. Engr., St. Francis Levee Bd., writes that the contract for levee work (bids opened June 21 by the St. Francis Levee Dist. of Ark.) has been awarded to Lawrence Bros. & Co., Shipply & Outzen and R. L. Leonard (Associated), of Memphis, Tenn. This firm bid for 76,620 cu. yd., 14 cts.; 176,294 cu. yd., 14.74 cts.; 223,541 cu. yd., 13.97 cts.; 354,309 cu. yd., 18.97 cts., and 59,000 cu. yd., 27.5 cts.

**Walnut Hill, Ark.*—R. R. Lee, Secy. and Treas. Long Prairie Levee Bd., writes that the following are the bids opened June 20 for building a levee from Bunkham Springs to the Louisiana State line, about 700,000 cu. yds: Cary Bros., Little Rock, $121,800; Dalhoff Constr. Co., Little Rock, $107,800 for cash and $119,700 for bonds, and Talley Bates Constr. Co., Memphis, Tenn, $106,680 (awarded contract).

Wilmington, Del.—Capt. C. A. Flagler, Corps Engrs., U S. A., writes that no bids were received June 21 for dredging in Alloway Creek, N. J. The work may be executed by the U. S. without contract, by hiring necessary men and plants, or it may be readvertised later in summer.

Washington, D. C.—Bids will be received until July 11 at the Bureau Supplies and Accounts, Navy Dept., Washington, for furnishing at the Navy Yards, Boston, Mass., New York, N. Y., League Island, Pa., and Washington, D. C., and the Naval Academy, Annapolis, Md., a quantity of naval supplies as follows: Structural iron work; turret machines; repairs to wharf; sheet brass and copper; galvanized sheet steel, brass, iron and copper pipe; gate valves; brass and iron pipe fittings, etc. H. T. B. Harris, Paymaster-Gen., U. S. N.

Washington, D. C.—See Power Plants, Gas and Electricity.

**Jacksonville, Fla.*—The contract for removing wrecks of the Ridgewood and Commodore Barney in St. Johns River, Fla. (bids opened June 15) has been awarded to Chas. W. Johnston, of Lewes, Del., for $2,490.

Savannah, Ga.—The Marine Engine & Machine Co., of New York, N. Y., has secured the contract for installing an electric passenger elevator at the Marine Hospital for $6,812.

Chicago, Ill.—Bids are wanted July 25 for dredging Chicago Harbor, Ill., as advertised in The Engineering Record.

**Geneseo, Ill.*—Frank S. Haynes, Comr. Green River Special Drainage Dist., writes that contracts for constructing drainage ditches (bids opened June 12) have been awarded as follows: To G. A. McWilliams, of Walnut, Ill., for 3,300,000 cu. yd., and to the Central States Drainage Co., of Marion, O., for about 1,200,000 cu. yd. There were about 15 bids received, and the work will average very close to 7.8 cts. per cu. yd.

Vincennes, Ind.—It is stated that bids will be received until July 6 by John T. Scott, Co. Aud., for repairing levee and flood gates in Lower Shaker Prairie drainage system.

New Orleans, La.—Bids will be received July 12 by Capt. J. F. McIndoe, Corps Engrs., U. S. A., for dredging at Amite River and Bayou Manchas, La.

Baltimore, Md.—The following are the bids opened on June 22 by Lieut. Col. R. L. Hoxie, Corps Engrs., U. S. A., for dredging in Susquehanna River, 79,000 cu yds. (price given per cu. yd.) Sanford & Brooks Co., Baltimore, 11.9 cts.; Maryland Dredging & Contr. Co., Baltimore, 11.5 cts.; John L. Grim, Philadelphia, Pa., 12⅞ cts.

Boston, Mass.—Bids will be received until July 22 by Col. W. S. Stanton, Corps Engrs., U. S. A., for dredging in Weymouth Fore River.

*F. N. Wales, Clk. Bd. Harbor & Land Comrs., writes that the contract for 900 ft. timber dike and 1,000 ft. wood fence with sand embankment at Stage Harbor, Chatham (bids opened June 27) has been awarded to J. J. Callahan, of Atlantic, for $5,445.

The following are the bids opened June 26 by Col. W. S. Stanton, Corps Engrs., U. S. A., for dredging (*a*) Weymouth River, (*b*) Town River, (*c*) Mystic River, (*d*) Salem Harbor: Simon J. Donovan, Boston, *a* 42 cts., *b* 35 cts.; Bay State Dredging Co., Boston, *a* 45 cts., *b* 36.25 cts.; Eastern Dredging Co., Boston, *a* 40 cts., *b* 34.25 cts., *c* 28.5 cts., *d* 26.5 cts.; J. S. Packard Dredging Co., Providence, *c* 27.9 cts.

Detroit, Mich.—The following are the bids opened June 20 by Lieut. Col. Chas. E. L. B. Davis, Corps Engrs., U. S. A., for dredging in St. Marys River at Bayfield Shoal, to consist of 85,000 cu. yd. full rate and 14,000 cu. yd. half rate (price given per cu. yd.): H. W. Hubbell & Co., Saginaw, 49 cts.; Hickler Bros., Sault Ste. Marie, 52 cts.; Lake Erie Dredging Co., Buffalo, 65 cts.; Lake Superior Contr. & Dredging Co., Duluth, Minn., 78 cts., and Sam'l O. Dixon, Milwaukee, Wis., 78 cts.

Bids were opened same time and place for dredging at entrance angle to Middle Neebish, *a* 294,000 cu. yd. soft material, full rate, and 21,000 cu. yd., half rate; *b* 98,000 cu. yd. hard material, full rate, and 7,000 cu. yd., half rate (price given per cu. yd.): Hickler Bros., Sault Ste. Marie, *a* 14 cts., *b* 67 cts.; Great Lakes Dredge & Dock Co., Chicago, Ill., *a* 13.9 cts.. *b* 70 cts.; the Lake Erie Dredging Co.. Buffalo, N. Y., *a* 18 cts., *b* 60 cts.; Lake Superior Contr. & Dredging Co., Duluth, Minn., *a* 65.5 cts., *b* 65 cts.; Sam'l O. Dixon, Milwaukee, Wis., *a* 17 cts., *b* 68 cts.

Detroit, Mich.—See "Paving and Roadmaking."

Grand Marais, Mich.—The following are the bids opened on June 26 by Maj. Chas. L. Potter, Corps Engrs., U. S. A., for pile dike work and riprap at Grand Marais (*a* for pile structure, 1,500 ft., per lin. ft.; *b* for slab filling, 500 cords per cord of 128 cu. ft.; *c* for rock ballast, etc., 11,000 tons, per ton of 2000 lb.; *d* total): Whitney Bros. Co. Superior,, Wis., *a* $4.30, *b* $5, *c* $1.70, *d* $27,650; Powell & Mitchell Marquette, Mich., *a* $3.50, *b* $4.50, *c* $1.70, *d* $26,200 (awarded contract).

**St. Cloud, Minn.*—O. F. Doyle, of St. Cloud, is stated to have secured the contract for the St. Joseph ditch at $6,520. The ditch will be 7 miles in length and cost 15 cts. per cu. yd.

**Vicksburg, Miss.*—A. T. Lane, of Tallulah, La., Secy Bd. Comrs. of 5th Levee Dist., writes that contracts for levee work in the 5th La. Levee Dist. (bids opened June 20) have been awarded as follows: To R. T. Clark, of Baton Rouge, La., for Cottage Home Levee enlargement, 17.7 cts. per cu. yd.; for Moro new levee, 13 cts., and for Knox Point south new levee, 14.4 cts. To Helgason Bros., of Vicksburg, for Evergreen-Bondurant levee topping, 32 cts., and to H. F. Garbish, of Vicksburg, for Cabin Teele levee enlargement, 21 cts.

Glendive, Mont.—Bids will be received at the office of F. E. Weymouth, Engr., U. S. Reclamation Service, Glendive, July 31, for furnishing 12,000 to 16,000 bbl. Portland cement, as advertised in The Engineering Record.

New York, N. Y.—See "Railroads."

New York, N. Y.—Bids will be received until July 7 by the Dept. Docks and Ferries (Maurice Featherson, Comr.) for furnishing materials and building a new pier at the foot of E. 138th St., Boro. Bronx.

*The following are the bids opened June 26 by the Dept. Docks & Ferries for furnishing material and erecting piers (a) Pier No. 28, East River; (b) Pier No. 13, East River: Bart. S. Cronin, 573 Clinton St., Brooklyn, (a) $57,400 (b) $44,350; Bernard Rolf, 39 Cortlandt St., (a) $55,583 (b) $40,898; Godwin Constr. Co., 60 Wall St., (a) $54,375; Wm. H. Jenke, 129 Pearl St., (a) $53,848 (awarded contract); (b) $38,544; Wm. E. Rogers, 441 B'way, (a) $58,900 (b) $43,878; R. P. & P. H. Staats, 29 B'way, (a) $55,250; Augustin Walsh, 96 Water St., (b) $37,321.

Governors Island, N. Y. H., N. Y.—The following are the bids opened Jcne 22 by Lieut. Col. W. L. Marshall, Corps Engrs., U. S. A., New York, for constructing stone sea wall at Governors Island, 2,050 ft. (price given per ft.): North Eastern Constr. Co., Fuller Bldg., New York City, $28.39; Brown & Fleming Contr. Co., 129 Broad

**Items marked thus give the names of parties awarded contracts.*

St., New York City, $20.25; Humphrey Toomey, Guilford, Conn., $20.70; Jas. C. McGuire & Co., 26 Cortlandt St., New York City, $22.95, and Cooper & Evans, 220 Bway, New York City, $29.76.

Cleveland, O.—The lowest bid opened on June 19 by Lieut. Col. Dan. C. Kingman, Corps Engrs., U. S. A., for improving Cleveland Harbor by dredging, was submitted by the L P. & J. A. Smith Co., of Cleveland, at 11.5 cts. per cu. yd. for about 1,2500,000 cu. yds. and the same has been recommended for award.

Sandusky, O.—The citizens are reported to have voted June 22 to issue $125,000 harbor improvement bonds, to be used by the city in removing rock and completing a 300-ft. channel, 21 ft. deep, to the west end of city.

Portland, Ore.—Bids will be received until July 24 by Maj. W. C. Langfitt, Corps Engrs., U. S. A., for constructing a portion of the Dalles-Celilo Canal, Columbia River, Ore. and Wash.

Panama.—Bids will be received by the Isthmian Canal Comn., Washington, D. C., July 27 for furnishing 11 steel barges, as advertised in The Engineering Record.

Bids are wanted until July 29 by the Isthmian Canal Comn., Washington, D. C., for furnishing Portland and La Farge cement, brick, roofing tile, copper wire, metal lathing, etc.

Panama.—Bids will be received by the Isthmian Canal Comn., Washington, D. C., July 31, for furnishing air compressors, drills and boring machines, sheet iron, etc., as advertised in The Engineering Record.

Norfolk, Va.—Bids will be received until July 20 by Capt. E. Eveleth Winslow, Corps Engrs., U. S. A., for dredging waterway from Norfolk Harbor, Va., to Albemarle Sound, N. C., as advertised in The Engineering Record.

**Whatcom, Wash.*—Maj. John Millis, Corps Engrs., U. S. A., Seattle, writes that the following are the bids opened June 16 for dredging Whatcom Harbor: 200,000 cu. yds. (price given per cu. yd.): Puget Sound Bridge & Dredging Co., Seattle, 16.8 cts.; North American Dredging Co., San Francisco, Cal., 14.74 cts. (awarded contract; Seattle Bridge Co., Seattle, 18.75 cts. and International Contr. Co., Seattle, 19.2 cts.

Charlestown, W. Va.—See "Electric Railways."

Madison, Wis.—A bill is reported to have been passed by State Legislature appropriating $60,000 for the improvement of the State Fair Grounds.

Milwaukee, Wis.—See "Bridges."

PROPOSALS OPEN

For Proposals see pages 81, 86, 87, 89, AND 91.

WATER WORKS.

Bids Close.		See Eng. Record.
Jul. 4.	Supplies, etc., Glace Bay, N. S.	Jul. 1
Jul. 5.	C. i. pipe, etc., Brooklyn, N. Y.	Jun. 24
Jul. 5.	Hydrants, pipe, etc., New York, N. Y.,	Jun. 24
Jul. 5.	Mains, Spokane, Wash.	Jun. 24
Jul. 5.	C. i. pipe, etc., Columbus, O.	Jun. 24
Jul. 6.	Reservoir, etc., Duluth, Minn.	
Jul. 6.	Water wks., Arcanum, O.	Jul. 1
July 6.	Water wks. franchise, Brighton, Ala.	July 1
Jul. 10.	Pipe, etc., Panama	Jun. 17
Jul. 11.	System, Tama, Ia.	Jun. 24
Jul. 11.	System, Slatington, Pa.	Jul. 1
Jul. 12.	Pipe and machy., Whittier, Cal.	Jul. 1
Jul. 12.	Mains, New York, N. Y.	Jul. 1
Jul. 17.	Bishopville, S. C. Adv. June 3 to Jul. 1.	Jun. 3
Jul. 17.	Valves, pipe, etc., Panama Adv. Jun. 17 to Jul. 1.	Jun. 17
Jul. 18.	System, Wahpeton, N. D.	Jun. 17
Jul. 18.	Mains and reservoir, Havre, Mont. Adv. Jun. 24, Jul. 1.	Jun. 24
Jul. 18.	Hydrants, etc., Washington, D. C.	Jul. 1
Jul. 19.	Pumps and engines, Panama Adv. Jun. 24, Jul. 1.	Jun. 24
Jul. 19.	Pumps, Brooklyn, N. Y.	Jul. 1
Jul. 20.	Ft. Pierre, S. D.	Jul. 1
Jul. 25.	Pipe, Cleveland Hgts., O.	Jul. 1
Jul. 29.	Pumps, Brooklyn, N. Y.	Jun. 24
Jul. —.	Water wks., Morehead City, N. C.	Jun. 17
Aug. 8.	Water works, Columbia, S. C. Adv. Jul. 1.	Jul. 1
Aug. 17.	Irrigation, Yuma, Ariz. Adv. Jun. 17 to Jul. 1.	Jun. 17

SEWERAGE AND SEWAGE DISPOSAL.

Jul. 5.	Cincinnati, O.	Jun. 17
Jul. 5.	Rensselaer, Wis.	Jul. 1
Jul. 5.	Chicago, Ill.	Jul. 1
Jul. 6.	Columbus, Ind.	Jul. 1
Jul. 6.	Buffalo, N. Y.	Jul. 1
Jul. 6.	Waco, Tex.	Jul. 1
Jul. 7.	Abilene, Kan.	Jun. 17
Jul. 7.	Altoona, Pa.	Jul. 1
Jul. 7.	Rock Falls, Ill.	Jul. 1
Jul. 8.	Macon, Ga.	Jun. 24
Jul. 8.	Portsmouth, O.	Jul. 1
Jul. 8.	Marshall, Minn.	Jul. 1
Jul. 10.	Tuskaloosa, Ala.	Jul. 1
Jul. 10.	Covington, Ky. Adv. Jul. 1.	Jul. 1
July 11.	Franklin, Ind.	July 1
Jul. 12.	Mamaroneck, N. Y.	Jun. 24
Jul. 12.	St. Bernard, O.	Jul. 1
Jul. 17.	Groton, S. D.	Jun. 24
Jul. 17.	Westfield, Mass. Adv. Jun. 24.	Jun. 24
Jul. 18.	Wahpeton, N. D.	Jun. 17
Jul. 21.	Utica, N. Y. Adv. Jun. 17 to Jul. 1.	Jun. 17
Jul. 22.	Ogden, Utah	Jul. 1
Jul. 25.	Laurens, S. C. Adv. Jul. 1.	Jul. 1
Aug. 1.	Toronto, Ont.	Jun. 17
Aug. 5.	Alliance, O.	Jun. 24

BRIDGES.

Jul. 5.	Tillamook, Ore.	May 27
Jul. 5.	Vale, Ore	Jun. 3
Jul. 5.	Fossil, Ore.	Jun. 17
Jul. 5.	Jacksonville, Fla.	Jun. 24
Jul. 5.	Martinsville, Ind.	Jun. 24
Jul. 5.	Spartanburg, S. C.	Jun. 24
Jul. 6.	Redding, Cal.	May 27
Jul. 6.	Lawrenceville, Ga.	Jun. 3
Jul. 6.	Pikeville, Ky.	Jun. 24
Jul. 6.	Weaverville, Cal.	Jun. 24
Jul. 6.	Waco, Tex.	Jul. 1
Jul. 7.	Baltimore, Md.	Jun. 17
Jul. 7.	Rutledge, Minn.	Jul. 1
Jul. 7.	Reading, Pa.	Jul. 1
Jul. 8.	Portland, Me. Adv. Jun. 17 to Jul. 1.	Jun. 17
Jul. 8.	Terre Haute, Ind.	Jun. 17
Jul. 8.	Independence, Mo.	Jul. 1
Jul. 8.	Rockport, Ind.	Jul. 1
Jul. 8.	Springwells (P. O., Detroit) Mich.	Jul. 1
Jul. 10.	Drury, Kan.	Jun. 24
Jul. 10.	Port Clinton, O.	Jun. 24
Jul. 10.	Sandusky, O.	Jul. 1
Jul. 10.	Wellington, Kan.	Jul. 1
Jul. 11.	Castlewood, S. D.	Jun. 10
Jul. 11.	Wabasha, Minn.	Jun. 17
July 14.	Cleveland, O.	July 1
Jul. 12.	Providence, R. I. Adv. Jul. 1.	Jul. 1
Jul. 14.	Owen Sound, Ont. Adv. June 24	Jun. 24
Jul. 18.	Anderson, Ind.	Jul. 1
Jul. 18.	Marietta, O.	Jul. 1

PAVING AND ROADMAKING.

Jul. 5.	Cincinnati, O.	Jun. 17
Jul. 5.	Emlenton, Pa. Adv. Jun. 17.	Jun. 17
Jul. 5.	Gravel road, Mt. Holly, N. J. Adv. Jun. 17 to Jul. 1.	Jun. 17
Jul. 5.	Stone road, Mt. Holly, N. J. Adv. Jun. 17 to Jul. 1.	Jun. 17
Jul. 5.	Knox, Ind.	Jun. 24
Jul. 5.	Brooklyn, N. Y.	Jan. 24
Jul. 5.	Logansport, Ind.	Jun. 24
Jul. 5.	Paoli, Ind.	Jun. 24
Jul. 5.	Irvington, N. J.	Jul. 1
Jul. 5.	Leonia, N. J.	Jul. 1
Jul. 5.	Vincennes, Ind.	Jul. 1
Jul. 6.	Charlotte, Mich.	Jul. 1
Jul. 6.	New York, N. Y.	Jul. 1
Jul. 6.	Newark, N. J.	Jul. 1
Jul. 6.	Pittsburg, Pa.	Jul. 1
Jul. 7.	Vincennes, Ind.	Jun. 17
Jul. 7.	Des Moines, Ia.	Jun. 24
Jul. 7.	Monroe, Wis.	Jun. 24
Jul. 7.	Indianapolis, Ind.	Jul. 1
Jul. 7.	Buffalo, N. Y.	Jul. 1
Jul. 7.	Chicago, Ill.	Jul. 1
Jul. 8.	Beloit, Wis.	Jun. 17
Jul. 8.	York, Pa.	Jun. 24
Jul. 8.	Beloit, Wis.	Jun. 24
Jul. 8.	Logansport, Ind.	Jul. 1
Jul. 8.	Seattle, Wash.	Jul. 1
Jul. 10.	Long Island City, L. I., N. Y.	Jul. 1
Jul. 11.	Telford road, Mt. Holly, N. J. Adv. Jun. 17 to Jul. 1.	Jun. 17
Jul. 11.	Ashland, O.	Jun. 24
Jul. 11.	Cleveland Heights, O.	Jun. 24
Jul. 11.	Peekskill, N. Y.	Jun. 24
Jul. 11.	Elkton, Md.	Jul. 1
Jul. 12.	Freehold, N. J.	Jun. 24
Jul. 12.	Providence, R. I.	Jul. 1
Jul. 14.	Clarinda, Ia.	Jul. 1
Jul. 15.	Boston, Mass.	Jul. 1
Jul. 15.	Crownpoint, Ind.	Jul. 1
Jul. 17.	St. Paul, Minn.	Jul. 1
Jul. 17.	Bridgeport, Conn. Adv. Jul. 1.	Jul. 1
Jul. 20.	Washington, D. C. Adv. Jun. 24 to Jul. 1.	Jun. 24
Jul. 24.	Flemington, N. J. Adv. Jul. 1.	Jul. 1
Jul. 25.	Tampa, Fla.	Jul. 1
Jul. 27.	Xenia, O. Adv. Jun. 24 to Jul. 1.	Jun. 24
———	Osceola, Ia. Adv. Jun. 24, Jul. 1,	Jun. 24
Aug. 1.	Belvidere. Ill.	May 20
Aug. 8.	Shreveport, La.	Jul. 1
Jul. 27.	Rhinelander, Wis.	Jul. 1

POWER, GAS AND ELECTRICITY.

Jul. 5.	Washington, D. C.	Jun. 24
Jul. 5.	Youngstown, O.	Jun. 24
Jul. 5.	Washington, D. C.	Jul. 1
Jul. 5.	North Tonawanda, N. Y.	Jul. 1
Jul. 6.	Arcanum, O.	Jul. 1
July 6.	Brighton, Ala.	July 1
Jul. 7.	Durant, Miss.	Jun. 3
Jul. 10.	Brooklyn, N. Y.	Jul. 1
July 12.	Pittsburg, Kan.	July 1
Jul. 10.	Gloversville N. Y.	Jul. 1
Jul. 11.	Lincoln, Neb. Adv. Jun. 17 to 24.	Jun. 17
Jul. 15.	Pensacola, Fla.	Jun. 17
Jul. 15.	Kings Mountain, N. C.	Jun. 17
Jul. 18.	Washington, D. C.	Jun. 24
Jul. 18.	Washington, D. C.	Jul. 1
Jul —.	Morehead City, N. C.	Jun. 17
Aug. 15.	Campbellsville, Ky.	Jun. 24

BUILDINGS.

Jul. 4.	Shelter, Toronto, Ont.	Jul. 1
Jul. 5.	Pub. Bldg. plans, Springfield, Mass.	Jun. 10
Jul. 5.	Court House plans, **Montgomery, Ala.**	**May 27**
Jul. 5.	**Pub. bldgs., National Military Home, O.**	Jun. 17
Jul. 5.	Pub. Bldgs., New York, N. Y.	Jun. 24
Jul. 5.	Hospital, Monson, Mass.	Jun. 24
Jul. 5.	School, New York, N. Y.	Jun. 24
Jul. 5.	Plmbg., etc., Hosp., Sykesville, Md.,	Jul. 1
Jul. 5.	Bus. bldg., Kokomo, Ind.	Jul. 1
Jul. 5.	School, Vincennes, Ind.	Jul. 1
Jul. 5.	School, Louisburg, N. C.	Jul. 1
Jul. 6.	Hospital, Dunlaps, Ia.	Jun. 3
Jul. 6.	School, Cleveland Heights, O.	Jun. 10
Jul. 6.	Pub. Bldg., St. James, Mo.	Jun. 24
Jul. 6.	Hotel Charlotte, N. C.	Jun. 24
Jul. 6.	School, La Crosse, Wis.	Jun. 24
Jul. 6.	School, Newark, N. J.	Jul. 1
Jul. 6.	School, Cleveland Hgts., O.	Jul. 1
Jul 6.	School, Pontiac, Mich.	Jul. 1
Jul. 6.	Post Bldgs., Ft. Wright, Wash.	Jul. 1
Jul. 6.	Armory, Buffalo, N. Y.	Jul. 1
Jul. 7.	Metal work, Light Sta., Phila., Pa. Adv. Jun. 10, 17.	Jun. 10
Jul. 7.	School, East Palestine, O.	Jun. 24
Jul. 10.	School, Cleveland, O.	Jun. 17
Jul. 10.	Courthouse, Wallace, Idaho	Jun. 24
Jul. 10.	School, Whitestone, L. I., N. Y.	Jul. 1
Jul. 10.	Town hall, Millersburg, Ind.	Jul. 1
Jul. 10.	Lodge bldg., Indianapolis, Ind.	Jul. 1
Jul. 11.	Hospital, Goshen, Ind.	Jun. 10
Jul. 11.	Plumb. in school, Lexington, Miss.	Jul. 1
Jul. 11.	School, Indianapolis, Ind.	Jul. 1
Jul. 11.	Htg. school, Ironton, O.	Jul. 1
July 11.	School, Alice, Tex.	July 1
Jul. 12.	Htg. court house, Cambridge, Minn.,	Jun. 10
Jul. 12.	P. O. Bldg., Deadwood, S. D. Adv. Jun. 17 to 24.	Jun. 17
Jul. 12.	Hospital, New York, N. Y.	Jun. 24
Jul. 12.	School, Fremont, O.	Jul. 1
Jul. 12.	School, Georgesville, O.	Jul. 1
Jul. 13.	Pub. Bldg. Albion, N. Y. Adv. Jun. 24, Jul. 1.	Jun. 24
Jul. 12.	Engine house, Bucyrus, O.	Jul. 1
Jul. 14.	School, Holyoke, Mass.	Jul. 1
Jul. 15.	Hotel, Little Rock, Ark.	Jun. 17
Jul. 15.	Jail, Ladysmith, Wis.	Jun. 24
Jul. 15.	Plans for school, Fayetteville, Ark.	Jul. 1
Jul. 17.	Post bldg., Ft. Warren, Mass. Adv. Jun. 24, Jul. 1.	Jun. 24
Jul. 17.	Plans for school, Fayette, Ark.	Jul. 1
Jul. 17.	Schools, Columbus, O.	Jul. 1
Jul. 17.	Plumb. in schools, Cleveland Hgts., O.	Jul. 1
Jul. 17.	School, Harshman, O.	Jul. 1
Jul. 18.	Schools, Wahpeton, N. D.	Jun. 17
Jul. 18.	Schools, Youngstown, O.	Jul. 1
Jul. 19.	Schools, Lancaster, O.	Jul. 1
Jul. 20.	Custom House, San Francisco, Cal.	Jun. 3
Jul. 20.	Court house, Mangum, Okla. Ter.,	Jul. 1
Jul. 20.	Courthouse, Manhattan, Kan.	Jul. 1
Jul. 22.	Hospital, New Orleans, La.	Jun. 17
Jul. 24.	P. O. Bldg., Fargo, N. D.	Jun. 17
Jul. 24.	School, Morning Sun, Ia.	Jul. 1
Jul 25.	P. O. Bldg., Muncie, Ind. Adv. Jun 24, Jul 1.	Jun. 24
Jul. 26.	P. O. Bldg., Spartansburg, S. C. Adv. Jun 24, Jul 1.	Jun. 24
Jul. 27.	Schools, Ft. Totten, N. D.	Jul. 1
Jul. 29.	Barracks, etc., West Point, N. Y. Adv. Jul. 1.	Jul. 1
Jul. 30.	Court House improv., Leesville, La. Adv. Jul. 1.	May 13
Jul. 31.	Light house bldgs., Detroit, Mich. Adv. Jul. 1.	Jul. 1
Aug. 1.	**Y. M. C. A. Bldg., Spokane, Wash.**	**Apr. 29**
Aug. 1.	P. O. Bldg., Adrian, Mich. Adv. Jul. 1.	Jul. 1
Aug. 1.	Library, Louisville, Ky.	July 1
Aug. 5.	Pub. bldg., Bremerton, Wash.	Jul. 1
Aug. 9.	Pub. bldgs., Chicago, Ill.	Jun. 17
Aug. 9.	Library, Bloomington, Ind.	Jul. 1
———	Schools, North Providence, R. I.	Jun. 17
———	School, Phoenix, Ariz.	Jun. 24
———	Remodeling Court House, Taylorville, Ky.	Jun. 24

MISCELLANEOUS.

Jul. 5.	Dredging, Baltimore, Md. Adv. Jun. 3 to Jul. 1.	Jun. 10
Jul. 5.	Rock, etc., New Orleans, La.	Jun. 17
Jul. 5.	Searchlight outfits, Wash., D. C. Adv. Jun 24, Jul 1.	Jun. 24
Jul. 6.	Jetty work, Wilmington, Del. Adv. Jun. 10 to Jul. 1.	Jun. 10
Jul. 6.	Dredging, Wilmington, Del.	Jun. 17
Jul. 6.	Gravel, Brooklyn, N. Y.	Jun. 24
Jul. 6.	Flood gates, etc., Vincennes, Ind.	Jul. 1
Jul. 7.	Conduit, Chicago, Ill. Adv. Jun. 17 to Jul. 1.	Jun. 17
Jul. 7.	El. Ry. work, Baltimore, Md.	Jun. 17
Jul. 7.	Pier, New York, N. Y.	Jul. 1
Jul. 8.	Jetty work, Block Island, R. I. Adv. Jun. 17 to 24.	Jun. 17
Jul. 8.	Dredging, Block Island, R. I. Adv. Jun. 17 to 24.	Jun. 17
Jul. 10.	Boiler, Wilmington, N. C. Adv. Jun. 17 to Jul. 1.	Jun. 17
Jul. 11.	Supplies, Washington, D. C.	Jul. 1
Jul. 12.	Dredging, Portland, Me. Adv. Jun. 10 to Jul. 1.	Jun. 17
Jul. 12.	Dredging, etc., Jacksonville, Fla. Adv. Jun. 17 to Jul. 1.	Jun. 17
Jul. 12.	Dredging, New Orleans, La.	Jul. 1
Jul. 14.	Dredging, Boston, Mass.	Jun. 17
Jul. 14.	Dredging, Mobile, Ala. Adv. Jun. 17 to Jul. 1.	Jun. 17
Jul. 15.	Storage plant, etc., Pensacola, Fla.	Jun. 17
Jul. 17.	Wire, etc., Memphis, Tenn. Adv. Jun. 24, Jul. 1.	Jun. 24
Jul. 17.	Dredging, Philadelphia, Pa. Adv. Jun. 17 to Jul. 1.	Jun. 17
Jul. 18.	Supplies, Washington, D. C.	Jun. 24
Jul. 18.	Supplies, Washington, D. C.	Jul. 1
Jul. 20.	Dredging, Honolulu, H. I. Adv. Jun. 24, Jul. 1.	Jun. 24
Jul. 20.	Rem. of wreck, Charleston, S. C. Adv. Jun. 24, Jul. 1.	Jun. 24
Jul. 20.	Dredging, Norfolk, Va. Adv. Jul. 1.	Jul. 1
Jul. 21.	Mchy. for lock, Pittsburg, Pa.	Jun. 24
Jul. 22.	Dredging, Boston, Mass.	Jul. 1
Jul. 24.	Destructor, Panama Adv. Jun. 24, Jul. 1.	Jun. 24
Jul. 24.	Canal work, Portland, Ore.	Jul. 1
Jul. 25.	Dredging, Chicago, Ill. Adv. Jul. 1.	Jul. 1
Jul. 27.	Steel barges, Panama Adv. Jul. 1.	Jul. 1
Jul. 29.	Dredging, etc., Bremerton, Wash.	Jun. 24
Jul. 29.	Supplies, Panama	Jul. 1
Jul. 31.	R. R. work, Miami, Fla. Adv. Jun. 24, Jul. 1.	Jun. 24
Jul. 31.	Air compressors, etc., Panama Adv. Jul. 1.	Jul. 1
Jul. 31.	Cement, Glendive, Mont. Adv. Jul. 1.	Jul. 1
Aug. 9.	Dock, Chicago, Ill.	Jun. 17
Aug. 26.	Coal plant, Olongapo, P. I.	May 6
Sep. 1.	Steel and iron, Sydney, N. S. Wales. Adv. Apr. 8, 22; May 6, 20; Jun. 3, 17. Jul. 1.	Apr. 8
Nov. 1.	R. R. work, Manila, P. I.	Jun. 17
Apr. 2,	'06. Harbor Work, Valparaiso, Chili, Adv. Apr. 29 to Jul. 1.	Apr. 29
———	Dam, etc., Charlestown, W. Va.	Jul. 1

**Items marked thus give the names of parties awarded contracts.*